IMPERIAL MYCOLOGICAL INSTITUTE
19 FEB 1934

TRINIDAD AND TOBAGO.

ADMINISTRATION REPORT

OF THE

DIRECTOR OF AGRICULTURE.

FOR THE YEAR 1932.

TRINIDAD:
PRINTED BY THE GOVERNMENT PRINTER,
GOVERNMENT PRINTING OFFICE,
PORT-OF-SPAIN.

1933.

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Council Paper No. 33 of 1933.

DEPARTMENT OF AGRICULTURE.

Administration Report of the Director of Agriculture for the year 1932.

Laid before the Legislative Council on the 7th April, 1933.

Previous Council Paper No. 85 of 1932.

Registered No. of Correspondence relating to the subject—M.P. No. 15518.

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[*Priced* 1/9.]

REPORT ON THE DEPARTMENT OF AGRICULTURE 1932.

CONTENTS.

	Page.
I.—Agricultural Export Industries	4
II.—Departmental Institutions and Other Activities—	
Cocoa	8
Sugar	10
Coconut Wilt Investigations	11
Development of the Grapefruit Industry	11
St. Augustine Nurseries and Citrus Station	12
Government Stock Farm and Veterinary Work	12
District Agricultural Work	13
Agricultural Co-operative Societies	13
Trial Shipment of Bananas	14
Poultry Exhibition	14
Agricultural Bank	14
Representation at Conferences Abroad	14
Imperial College of Tropical Agriculture	15
III.—Revenue and Expenditure	15
IV.—Staff	15
Annexures—	
Divisional Reports and Tables.	

DEPARTMENT OF AGRICULTURE.

Administration Report of the Director of Agriculture for the year 1932.

Council Paper No. 33 of 1933. *M.P. No. 15518.*

I.—AGRICULTURAL EXPORT INDUSTRIES.

The continued world-wide trade depression has again been a cause of anxiety and difficulty for the planting community and, according to the Customs returns, the total value of the agricultural exports in 1932 amounted to £1,667,594 as compared with £1,975,625 in the previous year. In the table below are the values of the various exports in 1932 as compared with 1931, and with the average values for the 3-year periods 1926-28 and 1929-31.

Agricultural Exports.

Article.	1926-1928 average yearly value.	1929-1931 average yearly value.	1931 value.	1932 value.
	£	£	£	£
Cacao	1,531,148	1,136,174	826,333	579,170
Sugar and Bye-products	1,014,677	939,360	934,633	888,092
Coconuts and Coconut Products ..	223,768	201,567	115,515	106,786
Coffee	12,833	20,370	16,276	21,124
Limes and Lime Products	6,056	27,886	34,921	18,086
Grapefruit and Oranges	2,028	3,547	4,587	13,606
Tonca Beans	1,824	7,665	3,583	12,993
Pulse, Beans and Peas	4,816	10,012	2,783	1,993
Livestock and Hides	8,441	7,076	6,221	3,015
Bitters	76,862	50,974	27,288	18,962
Miscellaneous	20,192	4,245	3,485	3,767
	£2,902,645	£2,408,876	£1,975,625	£1,667,594

2. Sugar, with its bye-products, stands out definitely as the most valuable agricultural export industry of the year under review while cocoa has been the tragedy of the year. In 1927 and in 1928 cocoa exports were valued at over £1,670,000 and £1,650,000, respectively; in 1932 the value was under £580,000 owing to the combined effects of low prices and an abnormally short crop.

3. As compared with the previous year, coconuts show a slight falling off, limes and lime products are worth less, and grapefruit and oranges, tonca beans, and coffee show definite increases in value.

4. Broadly, the acreages under cultivation have been the same as in 1932, but there has been a definite tendency to substitute sugar cane and some of the minor industries for cocoa.

COCOA.

Exports and Values.

5. During the seven years 1926-1932 the quantities and values of the colony's exports of cocoa were as follows :—

	Exports. lb.	*Value* £	*Price per fanega (lb.)* $ c.
1926	50,067,881	1,270,335	12.99
1927	51,934,857	1,671,883	15.82
1928	58,008,156	1,651,179	13.21
1929	61,888,740	1,446,127	10.99
1930	53,825,120	1,136,056	9.34
1931	57,186,512	826,333	6.88
1932	41,822,127	579,170	6.94

6. Prices continued to be low, and, unfortunately, the crop was far less than the average, falling to under 42,000,000 lb. as compared with an average of 56,000,000 lb. for the previous five years. Unfavourable weather conditions, coupled with the damage caused by thrips, was mainly responsible for the reduction.

Witchbroom Incidence.

7. Witchbroom disease was in much evidence during the year, and the areas in which this disease occurs have been widely extended while the incidence on individual estates has rapidly increased. The only favourable feature was that there was little direct evidence of the disease causing an appreciable crop reduction.

8. A special witchbroom campaign was undertaken in 1932, the details of which are described in a later section of this report.

Importance of Witchbroom Control Measures.

9. In his annual report, which is attached, the Mycologist, Mr. F. Stell, stresses the importance of two special campaigns for the control of the disease during the year—April-May and September-October. Owing to economic conditions the cost throws a serious burden on the cocoa grower, but this measure is essential for the well-being of the industry and neglect of the recommendation must necessarily prejudice the future. As pointed out in my report of last year, every effort should be made to adopt cultural practices that will result in increased crops to compensate for the additional expenditure involved in witchbroom control measures.

Thrips.

10. This pest has assumed a position of major importance and in certain areas in particular was responsible for very serious damage to the foliage with a resultant loss of crop. The inability to maintain cocoa estates at the former standard of cultivation can be regarded as a contributory cause of the increasing prevalence of thrips, but the bionomics of the pest have not yet been fully worked out. Certain sprays—nicotine and Bordeaux Mixture—are well-known specific remedies, but their cost at the moment, in relation to the value of cocoa, does not encourage their use. The subject is one that demands the fullest investigation.

SUGAR.

Sugar Production.

11. Weather conditions were on the whole favourable for the growth of the sugar cane and the production of sugar was but little short of the previous year, which was the record for the island. Production for the past seven years is shown below :—

	Tons.
1926	73,561
1927	51,982
1928	81,551
1929	89,926
1930	79,848
1931	98,573
1932	97,598

Exports and Values.

12. According to the Customs returns the exports of sugar, molasses, and rum were as follows during the years 1926-1932 : —

	Sugar.		Molasses.		Rum.		Prices Grey Crystals f.o.b. per ton.
	Exports.	Value	Exports.	Value.	Exports.	Value.	
	Tons.	£	Gals.	£	Gals.	£	£ s. d.
1926 ..	65,680	1,003,230	1,427,274	14,330	71,213	10,933	14 15 0
1927 ..	41,805	762,366	1,188,840	14,471	35,699	8,155	16 10 0
1928 ..	74,112	1,201,477	1,622,018	16,913	55,088	12,157	14 10 0
1929 ..	81,503	1,049,863	1,373,420	18,227	73,841	13,639	11 10 0
1930 ..	69,138	776,167	899,051	11,238	72,063	14,313	10 5 0
1931 ..	86,054	902,990	1,599,414	15,924	86,260	15,719	9 0 0
1932 ..	85,956	845,974	2,701,921	14,697	139,540	27,521	9 14 2

The Cane Farming Industry.

13. In 1932, 455,213 tons of cane were purchased by the Factories from cane farmers as compared with 384,948 tons in 1931, and the farmers received £276,857, on the basis of 12 shillings per ton, as compared with £230,990 in 1931. Owing to the voluntary maintenance by the Sugar Manufacturers of the price of 12 shillings per ton, the cane farmers were paid approximately £110,000 more for their canes than would have been the case had the Manufacturers governed their payments by the official sliding scale.

14. Unlike producers of cocoa and coconuts cane farmers have not felt the full effects of the low world prices, and there is evidence that there would be a rapid expansion in the acreage planted by farmers if the capacity of the factories were increased.

COCONUTS.

Exports and Values.

15. There was a small reduction in the value of coconuts and coconut products exported. Except for a short period in the year prices were low. Below are the exports and values for the years 1926 to 1932 :—

	Coconuts.		Copra.		Coconut Oil		Price of Copra.
	Exports.	Value.	Exports.	Value.	Exports.	Value.	
	Nuts.	£	lb.	£	Gals.	£	100 lb.
1926	5,041,036	25,135	13,858,996	166,263	82,791	15,373	23s.
1927	6,463,765	32,298	12,498,983	146,895	58,061	11,102	22s.
1928	6,799,655	34,824	21,351,860	227,555	65,285	11,860	20s.
1929	13,608,118	66,320	23,979,882	209,732	34,707	5,403	17s.
1930	5,886,127	25,830	21,891,259	175,965	41,154	5,938	14s.
1931	4,487,875	12,549	19,484,808	101,148	20,702	1,818	8s. 9d.
1932	3,847,245	12,822	15,418,906	91,444	26,461	2,520	10s. 2½d.

Coconut Oil Factories.

16. In 1932 the local oil factories purchased 8,079,525 lb. of copra as compared with 6,148,965 lb. in 1931, and the sum of £7,136 was distributed to copra producers in the form of a bonus.

Coconut Wilt.

17. Deaths from wilt were not as common as in the previous year, although losses in certain areas were sufficiently serious to make necessary the abandonment of this crop. Fortunately the trouble has not appeared in the more important coconut sections of the colony where conditions are apparently not favourable for its development.

LIMES AND LIME PRODUCTS.

Exports of Lime Products.

18. *Essential Oil.*— The lime industry was largely dependent during the year on the high prices paid for lime oil. Owing to the short crop there was an appreciable falling off in exports. The exports and values for the years 1926-1932 are given below :—

	Exports. Gals.	*Value.* £
1926	431	5,312
1927	104	1,454
1928	495	5,894
1929	797	9,516
1930	1,647	19,457
1931	2,413	32,071
1932	929½	12,840

19. *Lime Juice.*—The exports of lime juice were greater than in 1931, but the bulk of the juice was allowed to run to waste owing to the low market value for concentrated juice and the limited demand for raw juice.

	Concentrated Juice.		Raw Juice.	
	Exports.	Value.	Exports.	Value.
	Gals.	£	Gals.	£
1926	7,886	1,926	Nil.	Nil.
1927	4,488	1,154	Nil.	Nil.
1928	5,653	1,487	Nil.	Nil.
1929	55,455	11,562	Nil.	Nil.
1930	21,762	3,759	47,554	4,096
1931	4,012	458	22,931	2,007
1932	8,583	427	46,629	4,250

20. *Citrate of Lime.*—Citrate of lime was manufactured on a small scale, the export being 54,217 lb. valued at £424.

21. *Green Limes.*—From the evidence available it appears unlikely that lime juice will be able to compete with sugar as a source of citric acid. It is consequently a matter of some importance that a new outlet should be found for the West Indian lime, and a trade in green limes offers the best chance of success. Excellent propaganda was undertaken by the Permanent Exhibition Committee with the object of developing an interest in Canada in this product, and over 130,000 limes were distributed at the Canadian National Exhibition. The United States market should be further exploited in spite of the adverse tariff.

GRAPEFRUIT.

Exports.

22. There has been a marked increase in the export of grapefruits. Shipments during the past seven years have been as follows :—

	Exports. Boxes.
1926	54
1927	1,649
1928	23
1929	807
1930	2,184
1931	4,377
1932	10,973

Acreage.

23.—The area now planted in grapefruit is estimated to be 885 acres as compared with 535 acres in the previous year.

Citrus Growers' Co-operative Association.

24. With the exception of a small quantity of grapefruit exempted under the terms of the Ordinance, all exports passed through the Central Packing House erected and operated by the Citrus Growers' Co-operative Association. The report of the Association for the 1931-1932 season—the first year of the Association—proved highly satisfactory and reflected much credit on the management. The excellent inherent qualities of Trinidad grapefruit and the uniform packing (which is controlled by Government Inspection) have resulted in the Trinidad fruit taking a foremost place on the English market.

COFFEE.

25. During the year the prices for both Arabica and Robusta coffee were low, but the premium in favour of Arabica was not sufficient to offset the far larger returns from Robusta, and this variety is being used to an increasing extent, in particular for filling in blank spaces in cocoa. Exports and values during 1926-1932 were as follows :—

	Exports. lb.	*Value.* £
1926	497,688	20,371
1927	164,072	7,246
1928	265,410	10,883
1929	817,983	32,309
1930	491,988	12,525
1931	857,920	16,276
1932	908,492	20,822

TONCA BEANS.

26. The exports of tonca beans were over three times as great as in 1931 and the price paid locally was very satisfactory. The exports and values during 1926-1932 are given below :—

	Exports. lb.	*Value.* £
1926	83	8
1927	10,015	1,669
1928	884	147
1929	15,266	2,544
1930	9,219	1,538
1931	22,950	3,583
1932	69,276	12,993

IMPORTATION OF FOODSTUFFS.

27. Little can be added to the general comments in my annual reports for 1930 and 1931 regarding the desirability of a determined effort being made to reduce the heavy bill paid each year by this colony for imported food. Examination of the imports for 1932 show that savings have been effected here and there, but the total cost still remains excessive when considered in relation to the value of the agricultural exports for the same period.

28. Cattle for slaughter show a slight reduction, rice is almost the same as in the previous year and cost the colony £157,769 ; the purchase of flour meant an outlay of £283,722 ; condensed milk cost £103,765 ; and vegetables, including onions, Irish potatoes, and plantains from abroad, absorbed a sum of over £60,000.

29. During the year a scheme was initiated for the disposal of Crown Land in small lots for the purpose of encouraging the production of food crops for local consumption, and the working of the scheme will be closely watched by officers of the Department.

II.—DEPARTMENTAL INSTITUTIONS AND OTHER ACTIVITIES.

30. Reports by the officers who are in charge of different branches of the activities of the Department are attached, and the notes that follow touch on the salient features of the work during the year.

COCOA.

River Estate.

31. River Estate was fortunate in 1932, for although weather conditions were unfavourable for cocoa in a great many areas, the Diego Martin valley was not adversely affected and the crop at River was 1,352 bags as compared with 1,008 bags in the previous year. The total exports for the colony on the other hand fell to three-quarters of the amount for 1931.

32. In the report of the Manager, Mr. R. O'Connor, will be found a detailed account of the routine work of the estate, and the results of the various experiments are recorded by Mr. J. de Verteuil, Agronomist, in his report.

Experimental Work.

33. The series of experiments inaugurated a number of years ago have been continued and below are some of the results brought up-to-date.

34. *Distance Planting.*—These tests have been maintained for 15 years and there has been during this period a slight advantage in favour of the 12 feet by 12 feet distance plots, while the 14 feet by 14 feet plot is not far behind. For the year 1932 the 16 feet by 16 feet plot gave the highest yield.

35. *Shade Reduction.*—Of the three plots Full Shade, Partial Shade, and No Shade, the Partial Shade plot continues to yield the most heavily of the three.

36. *Budded Plants vs. Seedlings.*—As in previous years this experiment, which was started in 1918, has not shown any marked difference between Budded plants and Seedlings.

37. *Colour of Pods.*—The yields for 1932 for the Colour of Pods experiment, worked out in pounds of commercial cocoa per acre, are as follows :—

	Yellow.	*Red.*
Two buds on same stock, one yellow and one red	.. 193	601
Two buds on separate stock, one yellow and one red	.. 217	388
Two seedlings at same stake, one yellow and one red	.. 128	405

38. *Fertiliser and Manurial Experiments.*—A fertiliser experiment to test the value of phosphates was started in 1932 on a section of the 12 feet by 12 feet distance plot. The experiment was laid down as a latin square and has the added advantage that the yields of individual trees are known for a number of years back. Plans were made for another experiment to test the effect of nitrogenous, potassic, and phosphatic manures.

39. As stated in my annual report for 1931 the results of the previous experiments have been inconclusive and it is hoped that the new plots will give more definite information.

Thrips.

40. In common with the rest of the island thrips were worse at River Estate than has been the case for a number of years.

Progeny Plots.

41. A block of 12 acres was prepared during the year for testing, on a comprehensive scale, the progeny of six of the best of the trees on the estate, including 406 and 969 which were originally selected as high yielding strains known to transmit this quality to their progeny.

Timber.

42. The timber plantations which are 500 acres in extent give promise of being a very valuable asset, in spite of the fact that it has not yet been practicable to find adequate funds for their care or to devote sufficient time to their supervision.

Facilities afforded to the Cacao Research Staff.

43. The officers of the Imperial College of Tropical Agriculture engaged on Cacao Research have been given every opportunity for making use of the facilities obtaining at River Estate. Mr. Pound has examined a large number of trees and taken measurements and yields of pods and beans. Professor Cheesman and Mr. Pound have prepared and published a paper on " Uniformity Trials on Cacao " based on the records of individual trees at River Estate. And the new fertiliser experiments referred to above are being carried out in co-operation with Professor Hardy.

44. It will be gratifying to my predecessor, and to others who in the past accumulated the mass of data now available at River Estate, to know that their work is proving of considerable service to those engaged in an intensive study of certain of the problems associated with the growth of cacao.

Witchbroom Disease of Cocoa.

Witchbroom Inspection Service.

45. Over 30,000 visits were paid by Witchbroom Inspectors to cocoa properties ; 504 orders were issued and compulsory action was taken in 14 cases ; five proprietors were prosecuted.

Spread of Witchbroom Disease.

46. During the year under review the incidence and intensity of Witchbroom was particularly severe and the disease has now been reported on over 3,800 properties as compared with 2,454 to the end of 1931. Many properties that in the previous year were but lightly affected showed evidence of heavy infection. Fortunately the detectable loss in yield as a result of this disease cannot yet be said to be serious for the island. There was, however, one case in which the proprietor reported that about 25 per cent. of the mature pods were attacked by witchbroom.

Special Campaign.

47.—Owing to the heavy incidence of the disease a special campaign was organized by the Department and carried out in May and the early part of June. Approximately 7,000 acres in the L'Ebranche and Guaico-Tamana districts were selected and over 1,000,000 cocoa trees, or one-half of those in the area were found to be affected. The trees were thoroughly combed of all visible evidence of the disease at a labour cost of about ten shillings per acre. The work was under the close supervision of the Assistant Director whose report on the Campaign was published as Council Paper No. 76 of 1932.

Marper Witchbroom Estate.

48. Marper estate continues to serve a useful purpose in enabling the Department to keep a close watch on the behaviour of Witchbroom in the area that is most favourable for its development. The control measures under trial do not suggest that any of a wide range of sprays can be recommended for control purposes ; similarly different fertilisers have not given any evidence of having an influence on the disease. As in the past, the trees on the undulating areas were far less heavily infested than those on the flats, and there is some ground for satisfaction in the fact that the count of brooms for 1932 was less than in 1931.

SUGAR.

Sugar Cane Investigation Committee.

49. The year has been an active one for the Sugar Cane Investigation Committee with which the Department is associated owing to the fact that the Director of Agriculture is Chairman of the Committee and the Assistant Director is Chairman of the Scientific Committee. The results of the work of the scientific staff are to be found in the monthly Proceedings of the Committee where accounts are given of the manurial and cultural experiments and of the froghopper investigations.

50. A contribution by the Empire Marketing Board to the Committee allowed of the work being extended.

Froghopper Damage.

51. The first brood of froghoppers emerged in May, and towards the middle of June the distribution of the pest was unusually widespread, but fortunately the damage done to canes during the year was not severe, except in certain restricted areas.

Biological Control Investigations.

52. Dr. J. G. Meyers, with Mr. D. Vesey-Fitzgerald as his assistant, left in June for an extended tour in Brazil in search of a parasite for the control of the froghopper, but the results, in this connection, have not yet been successful. An active parasite attacking the small cane borer (*Diatraea*) was, however, discovered.

Varietal Trials.

53. The Sugar Cane variety trials outlined in my report for 1931 have been fully reported on by the Assistant Director of Agriculture in a bulletin that has recently been issued.

54. These trials have been continued and experiments are now being conducted at fifteen centres in co-operation with the management of the larger sugar estates.

55. Details of the results will be found in the Summary prepared by the Assistant Director of Agriculture and attached to this report. In general it can be stated that B.H.10(12) held its own as the cane for soils of fair fertility, and other canes, such as B.726 and C.O.213, have proved to be well worthy of further trial.

Survey of the Cane Farming Industry.

56. In 1931 the Imperial Sugar Conference held in London recommended the critical examination of the cane farming industry in different sugar growing countries of the Empire. Thanks to the funds provided by the Empire Marketing Board it was possible for arrangements to be made for a detailed survey of the cane farming industry in Trinidad. The work was commenced in September and is being undertaken by the Assistant Director with a temporary clerical and field staff. A preliminary report is now in course of preparation.

COCONUT WILT INVESTIGATIONS.

57. The survey in 1931 of coconut cultivations, both large and small, brought to a close the first stage of the coconut wilt investigations of the Department, and useful information of a general nature was obtained bearing on the intensity and distribution of the disease.

58. In 1932 the second stage was entered. Critical study was commenced of the conditions under which wilt occurs on certain of the estates selected from among the 400 coconut cultivations on which the disease was found.

59. It was soon clear that chemical analyses of soils and of affected and healthy coconut palms and examination of fluctuating moisture conditions were imperative if any progress was to be made. With the sanction of His Excellency the Governor, the work of Mr. F. M. Bain, Chief Inspector under the Plant Protection Ordinance, was re-arranged in such a manner as to allow of his devoting the greater portion of his time to field and laboratory investigations in connection with this disease.

The Principal of the Imperial College of Tropical Agriculture and Professor F. Hardy kindly provided laboratory accommodation and facilities for Mr. Bain in the Chemical Department of the College.

60. The work undertaken during the year can be divided into five groups :—

(1) Field observations and enquiries into the history of the disease on selected estates.
(2) Chemical analyses of soils and moisture determinations.
(3) Analyses of the ash of leaves.
(4) Studies of the root systems of healthy and affected palms.
(5) Fertiliser experiments.

61. A perplexing feature of the work is the difficulty of anticipating when a given field, or individual coconut palms will be affected by wilt ; and, in particular, of doing so at such period beforehand as will allow of a test being made of the cause, or of control measures, before the palms have been affected to an extent that will eventually prove fatal. Also, the cause is presumably due to a fluctuating and not a static factor and may have disappeared before the evidence of its effect on the palm becomes visible. Added to these difficulties is the fact that coconut palms are not as a rule killed by the disease until they reach the age of at least 12 years.

62. It would be premature to draw conclusions with any degree of confidence at the moment, but Mr. Bain has accumulated sufficient evidence to justify the belief that certain of the causes of this trouble are being determined. In some cases the cause may be a straightforward issue of the destruction of roots under waterlogged conditions in the rainy season, with the consequent upsetting of the balance between root absorption and leaf transpiration during the dry season. In " diseases " of an apparently similar character in other countries, leaf analyses have proved useful owing to the fact that the percentage of different elements present in the leaf affect the water contents and result in varying rates of transpiration. For this reason examination is being made of the percentage of potassium in particular in the leaves of healthy and affected palms.

DEVELOPMENT OF THE GRAPEFRUIT INDUSTRY.

63. The Economic Botanist, Mr. R. O. Williams, devoted a considerable amount of time, as usual, to matters associated with the further development of the grapefruit industry ; he has kept in close touch with the nursery work of the Department, with the grapefruit cultivation in the colony, and with the operations of the Central Packing House.

64. Budded grapefruit to the number of 13,428 were distributed by the Department as compared with 6,022 in the previous year, and the acreage under grapefruit was estimated to be 885 at the end of 1932 as compared with 535 at the end of 1931.

65. The sound policy of building up this industry on budded stock, of establishing a Central Packing House on a co-operative basis, and of instituting a system of Government Inspection has proved of much benefit to growers. As a result of these measures, Trinidad grapefruit ranks high on the English market as a fruit of quality, and sales were effected during the 1931-1932 season at very satisfactory prices.

ST. AUGUSTINE NURSERIES AND CITRUS STATION.

66. The new nurseries at St. Augustine are now well established and during the year the distribution of economic plants amounted to 88,000 of which over 13,000 were budded grapefruit, 37,000 cocoa seedlings and 29,000 lime seedlings. In addition 38,000 citrus buds were distributed. The receipts for plant sales amounted to £1,203 as compared with £740 in 1931.

67. An important feature of the work of the year was the planting up of a citrus block of approximately 45 acres.

68. The banana plots were disappointing and clearly indicated that, even in a season of unusually well distributed rainfall, this crop demands heavy applications of manure.

69. The breeding work designed to produce a lime resistant to withertip was continued and commercial tests of oil prepared from T.1 were made during the year. The results of these tests will be found in the report of Mr. R. O. Williams, Economic Botanist, on the work at the Nurseries and the Citrus Station.

GOVERNMENT STOCK FARM AND VETERINARY WORK.

Government Stock Farm.

70. Detailed information relating to the work of the Government Stock Farm will be found in the report by Dr. H. V. M. Metivier, Officer-in-Charge.

71. Progress was made with the most important feature of the work at the Farm, namely, the breeding of a Friesian-Zebu cross in an endeavour to develop a type of animal suitable for dairy purposes in the tropics. During the year the ½, ¾ and ⅞ herds have been increased in number with a view to allowing of a reliable opinion being formed as to the relative merits of the different grades.

72. The annual Sale was held in December, and in spite of the depression an appreciably larger sum was realized than in the previous year—$3,445.00 as compared with $2,650.00.

73. Government institutions were supplied with 28,112 gallons of milk.

74. The animals were maintained in good health and excellent condition, and the routine work of the Farm was efficiently carried out during the year.

Paralytic Rabies.

75. In 1931 the disease that had been attacking livestock in the island since 1925 was definitely determined to be paralytic rabies and was demonstrated to be associated with the bites of bats. Early in 1932 inoculations were commenced with an anti-rabies vaccine and over 6,000 animals were treated during the year.

76. The erratic manner in which paralytic rabies appears first in one district and then in another district some distance off has been a noticeable feature of the disease since its inception. Starting in the north it jumped to the southern portion of the island. In 1932 the south was far less affected than in the previous year, but during this year the disease assumed serious proportions in the county of Caroni being found in some areas that it had previously skipped.

77. In Caroni many deaths occurred and the losses of livestock owners can be conservatively estimated at over £5,000. These losses fell with peculiar severity on a number of cane farmers and small cocoa proprietors dependent on animals for the transport of their produce.

78. The need for provision by Government for the manufacture of larger supplies of vaccine and for full research into the nature of the disease has been recognized, and a Committee, with the Director of Agriculture as Chairman, was, on the suggestion of the Board of Agriculture, appointed by His Excellency the Governor to make full enquiries into the cause of the disease and to make recommendations for its better control.

79. When on leave in England, the Government Veterinary Surgeon took the opportunity of keeping in touch with the research work at the Weybridge Laboratories on the nature of the disease and on control measures, and acquired information that is of much value.

DISTRICT AGRICULTURAL WORK.

80. As usual the Agricultural Advisers have been kept busy with a variety of tasks in addition to their main duty of giving advice on agricultural matters to peasant proprietors in particular. Their work included the inspection of properties mortgaged to the Agricultural Bank, the valuation of properties for the Public Works Department, and the inspection of School Gardens.

81. One special project was kept well in mind, namely, the desirability of effecting an improvement in the curing of cocoa by the small proprietor. In Tobago the two established Fermentaries continued their good work. In Trinidad, proprietors in Diego Martin formed themselves into an association for the purpose of marketing their cocoa, the preparation being carried out separately on each member's property. The progress made in this important matter has been slower than the Department would have wished, but there has certainly been some measure of awakening to the monetary benefit that accrues from a general improvement in the quality of the lower grades of Trinidad cocoa.

82. In the Siparia area assistance was given to those experimenting with the growth of tobacco.

83. The Agricultural Adviser in Tobago devoted much time to giving practical guidance and assistance to the various co-operative movements in that island, and during the year attended 111 meetings with this object in view.

AGRICULTURAL CO-OPERATIVE SOCIETIES.

Agricultural Credit Societies.

84. *Tobago.*—There are thirteen agricultural credit societies in Tobago, under the supervision of Mr. F. D. Davies, Agricultural Adviser, the membership of which amounted to 524 at the end of 1932. During the year new loans granted by Government amounted to £745. The sum of £1,213 was repaid as capital and interest on old and new loans, and the indebtedness of the societies amounted to £2,967 of which the sum of £1,231 is overdue. With the continued depression in market values of cocoa and other agricultural produce, the present time is not propitious for insisting on the prompt repayment of loans as they become due, but every effort is being made to strengthen the position of the societies.

85. *Trinidad.*—In Trinidad there are twenty-two credit societies under the management of the Ste. Madeleine Company, three old and eight new societies.

86. The position of the three old societies has not been satisfactory for several years, but there has recently been a marked reduction in the amounts owing by two of these societies in particular.

87. The eight new societies were formed under the guidance of Mr. C. K. Hutchinson, Agricultural Adviser, and an important feature of the loans is the arrangement that they are definitely yearly crop advances and are to be repaid to Government within the year. It is hoped by this means to establish a sounder outlook on the part of members than is the case when loans are repayable to Government in three years. The membership of the eleven societies amounted to 397 at the end of December and the advances for which they are responsible to £1,220.

Tobago Producers' Association.

88. Since its inception this Association has confined its activities to fostering co-operation, but definite plans have recently been made to take up the co-operative sale of ground provisions, livestock, poultry, and eggs.

Tobago Lime Growers' Co-operative Association.

89. This Association has had a successful year and handled 2,082 barrels of limes for which $1.30 per barrel was paid. Prior to the formation of the Association much of the lime crop was allowed to rot on the ground.

Cocoa Fermentaries—Roxborough and Pembroke.

90. The year's working has been fairly successful, but proper buildings and curing facilities are urgently needed as both societies have outgrown the existing buildings.

Co-operative Citrus Growers' Association of Trinidad and Tobago.

91. For the 1931-32 season the Association handled 10,700 cases of grapefruit and 1,566 cases of oranges, apart from the fruit that was sold locally. Satisfactory prices were obtained and the members and management are to be congratulated at the success of the year's working—a year in which the exports of grapefruit were doubled as compared with the previous year.

TRIAL SHIPMENT OF BANANAS.

92. As the result of the deliberations of a Committee appointed by Government to inquire into the possibility of developing a new agricultural export industry, it was decided that trial shipments of bananas should be organized by the Department.

93. In all seven shipments were made—five to England and two to New York—through the courtesy of Frederick Leyland & Co., Ltd., and Furness Withy & Co., Ltd. No freight was charged by the companies for five of the shipments and a number of planters provided bananas free of cost.

94. The financial results were disappointing, calculated on a commercial basis for freight and handling, but the reports received regarding the quality of a proportion of the Gros Michel bananas shipped were distinctly encouraging. On the other hand, an excessive amount of bruising was reported and it is hoped that it will be found possible to make arrangements for further trial shipments as the development of a subsidiary export banana industry would have many advantages to the colony. This fruit is now being grown in the colony in quantities that are in excess of the local demand ; the plant is a useful shade for cocoa ; and the industry, if developed, would be one in which both the larger planters and the peasant proprietors could participate. The absence of large tracts of virgin land with suitable soil and adequate rainfall and the existence of Panama disease are definite disadvantages, but, in the opinion of the Committee referred to above, these facts should not stand in the way of serious efforts being made to test fully the marketing possibilities.

95. The supervision of the trial shipments was undertaken by the Economic Botanist whose account of the shipments is embodied in his report for the year.

POULTRY EXHIBITION.

96. Towards the end of the year, the newly-formed Poultry Association held an exhibition at which the standard of exhibits was of a high order of merit. The Assistant Director was an active member of the Committee of Management.

AGRICULTURAL BANK.

97. The Director of Agriculture served on the Board of Management of the Agricultural Bank and the Agricultural Advisers were responsible for the inspection of properties mortgaged to the Bank.

REPRESENTATION AT CONFERENCES ABROAD.

98. A successful and instructive Conference of the International Sugar Cane Technologists was held in Puerto Rico in March, and was attended by Mr. S. M. Gilbert, Assistant Director, as representative of the Government of Trinidad and Tobago. Mr. Gilbert's report was published as Council Paper No. 79 of 1932.

IMPERIAL COLLEGE OF TROPICAL AGRICULTURE.

99. I desire to acknowledge my indebtedness and that of the other officers of the Department to the Principal and members of the Staff of the Imperial College of Tropical Agriculture for their close co-operation in various matters relating to the work of the Department.

100. In particular, the College has assisted the Department in connection with the trial shipments of bananas ; advance information has been supplied to the Department as soon as results of practical value have emerged from the work of the Cacao Research staff ; and the laboratory facilities provided by the College have made possible the investigations now in progress into the cause of the wilt disease of coconuts.

III.—REVENUE AND EXPENDITURE.

101. In Appendix B will be found details of the expenditure for 1932 which was £50,560 as compared with £45,267 in 1931. The revenue amounted to £17,414 in 1932, of which the Stock Farm was responsible for £5,911, River Estate for £3,246, and the St. Augustine Nurseries and Station for £2,080. The fees collected by the Veterinary Division amounted to £1,360.

102. The increased expenditure is largely due to the cost of the special Witchbroom campaign. Although the full cost is shown as a vote to the Department, a portion of the expenditure will be recovered by Government. Apart from the special campaign against witchbroom, the routine work of inspection proves costly, and in all a sum of £9,954 was expended on plant protection services.

103. Maintenance of the Royal Botanic Gardens, and other public grounds and pastures, including the Queen's Park Savannah, cost £3,347.

104. The total expenditure quoted above includes the sum of £2,126 which was voted by Government for assisting the work of the Sugar Cane Investigation Committee.

IV.—STAFF.

105. The following new appointments were made during the year :— Mr. F. C. Almandoz, Jnr., Librarian ; Mr. H. Bruins-Lich, Curator, Royal Botanic Gardens.

106. The following officers were absent from the Colony on vacation leave :— Capt. H. V. M. Metivier, Government Veterinary Officer and Officer-in-Charge of the Government Farm, from May to December ; Mr. J. de Verteuil, Agronomist, from June to December ; Mr. F. C. Buthn, Manager, St. Augustine Nurseries, from June to December ; and Mr. J. H. Brooks, Clerk, Government Farm, from January to March.

107. In conclusion, it gives me much pleasure to acknowledge the keen interest taken by the Officers of the Department in their work.

E. J. WORTLEY,
Director of Agriculture.

18th March, 1933.

REPORT OF THE DEPARTMENT OF AGRICULTURE, 1932.

DIVISIONAL REPORTS.

	Page.
Division of Botany	17
Report of Agronomist	24
Government Stock Farm, Trinidad	35
Report of Veterinary Division	38
River Estate	40
Report of Mycologist	47
Witchbroom Investigations	49
Report of the Chief Inspector under the Plant Protection Ordinance	52

Appendices :

A.—Cane Variety Trials	53
B.—Revenue and Expenditure, 1932	56
C.—Principal Agricultural Exports, Trinidad and Tobago	57
D.—Annual Rainfall, Port-of-Spain, Trinidad	58

REPORT OF ECONOMIC BOTANIST.

Staff.

Mr. H. Bruins-Lich was appointed Curator on 5th August and assumed duties on the 22nd of the same month.

2. Mr. Redon's appointment as Clerk of the St. Augustine Nursery was confirmed in May, 1932.

3. Mr. Collier Jones', Citrus Adviser to the Packing House contract expired on 20th May and Mr. C. B. Anderson was appointed on 1st December for a period of six months and on 23rd December as an Inspector under the Export of Fruit Ordinance.

4. Mr. A. A. Brunton was appointed Office and Field Assistant at the Citrus Experiment Station, St. Augustine.

5. Miss C. Seheult, Herbarium Assistant, resumed duties on 1st January after being absent on vacation leave from 16th July, 1931. Mr. F. C. Buthn was granted six months vacation leave ; he resumed duties onthe 29th December. Mr. L. A. Brunton acted as Manager during his absence. Mr. E. Beharry, Overseer, Botanic Gardens, was granted vacation leave from the 1st to 31st October.

Royal Botanic Gardens and Government House Grounds.

6. *Effect of* 1931 *Drought*—The gardens have recovered somewhat from the effect of the 1931 drought, although it will take a considerable time to replace certain trees and features which were lost, notably the nutmeg ravine which was, for many years, one of the most attractive parts of the gardens. Seven of the remaining nutmeg trees have died during the year. It is doubtful if, what was before the drought, the finest specimen of *Amherstia nobilis* in the front of the gardens, will recover.

7. *Flower Garden.*—A few changes have been made, some beds which were thought unnecessary being dispensed with, and the Cannas in the two rows of circular beds replaced by annuals. A show of flowers has been maintained for the greater part of the year.

8. *Hedges.*—The Hibiscus hedge around Government House lawns was badly affected with nematodes and arrangements were made to replace it with "Mrs. Butt" Bougainvillaea. On the western fence of Government House grounds a hedge of *Malvaviscus aboreus* was planted.

9. *Trees.*—Regular attention has been given the trees as regards removal of Bromeliads, the cutting out of dead wood, and the pruning of lower branches.

10. *Nursery and Orchid Houses.*—This area has been slightly extended to make provision for raising bedding plants, work which was previously done at St. Clair.

11. *Lawns.*—The weather was particularly favourable to the grass and little damage by mole crickets or chinch bugs was noticed.

12. *Roads.*—The heavy rain caused considerable damage to the roads and paths ; repairs and maintenance work was done.

13. *Seed List.*—A list of seeds available for exchange was compiled and forwarded, on request, to correspondents.

14. *A new Bougainvillaea.*—In 1931 Mrs. H. R. McLean brought to the writer's notice a new Bougainvillaea arising as a bud mutant from Mrs. Butt and presented the gardens with cuttings. These grew and the new variety is now well established.

15. The young bracts are of a very pretty brick-red colour before the inflorescence is fully expanded changing later to pinkish mauve. The colour differs from the well known brick-red which is in bud quite reddish and changes with age to brick-red.

Head Office Grounds.

16. The area immediately surrounding the office was maintained in good condition, and that allocated for development as a residential area attended to for the prevention of mosquito breeding. Certain economic trees on this area are still being utilised in furnishing stock for the St. Augustine Nursery.

Red House Grounds.

17. These were maintained as usual. An improvement in the condition of the grass is to be noticed, the new lawn of Java grass (*Polytrias praemorsa*) has done particularly well.

Trees on Government Lands.

18. All trees under the charge of the Department were inspected and attention given when needed.

St. Augustine Nursery.

19. The Manager reports on the routine work of the Nursery as follows :

20. *Orchard Plots.*—The plots of fruit trees planted for propagation purposes are now well established and propagating material will soon be available from them.

21. *Avocado.*—The seven varieties planted have grown well. Pollock has made the best growth and is now 14 feet high.

22. *Citrus.*—Oranges, Mandarines, Tangelos, Limes, have all made good growth and some have fruited.

23. *Mangoes.*—These have grown exceptionally well, Julie having flowered and fruited.

24. *Plant Distribution.*—Plants distributed in 1932 were 98,867 as compared with 71,438 in 1931.

25. Despite the market price of cocoa remaining low the number of cocoa plants distributed increased from 15,209 in 1931 to 37,672 in 1932. Coffee seedlings decreased, 976 only being distributed. Seedling limes decreased by 6,399. Grafted mango plants increased by 171 and budded Avocado Pears by 223.

26. The number of grapefruit plants on order being larger than could be supplied orders were executed *pro rata* ; distribution commenced in June with plants remaining over from the previous year. The total number distributed was 13,428 as compared with 6,022 in 1931. There are remaining in the beds 12,000 small plants which will be ready for early lifting in 1933. In addition to the orders not completed in 1932 which have to be carried forward to 1933 large new orders for grapefruit continue to be received.

27. *Revenue.*—Revenue for all plants and other products was £1,203 12s. 4d., as compared with £740 17s. 0½d., in 1931, the increase of £462 15s. 3½d., being due to increased sales of budded and grafted fruit trees and cacao seedlings.

28. A detailed list of plants, seeds, cuttings, &c., distributed, is given below —

Cocoa :		
Seedlings		37,672
Coffee :		
Robusta		976
Fruit, Budded and Grafted :		
Grapefruit (Marsh)	11,823	
Do. (Assorted)	1,605	13,428
Oranges		1,543
Mangoes		1,123
Avocados		743
Limes		29,414
Miscellaneous fruits		1,423
Timber trees		1,461
Other Economic plants		219
Decorative plants		8,050
Total number of plants distributed		96,052
Budwood	38,503	
Cuttings	198	
Seeds :		
Countable	27,000	
Miscellaneous	..195 pkts. and 14 lbs.	
Fruits	4,587½ lbs.	
Prepared budding tape	888 yards	

29. The British Guiana and Barbados Departments of Agriculture were regularly supplied with budwood of oranges and grapefruit. One Wardian case containing a miscellaneous collection of plants was prepared and despatched to the Director, Royal Botanic Gardens, Kew. Distribution of plants free and in exchange have been made to many other persons and public institutions.

30. *Sour Stock.*—Approximately 45,000 sour orange seedlings have been planted out; to accommodate these, two acres occupied by bananas were cleared.

31. Scab (*Cladosporium citri*) continues to cause considerable losses in the young plants; it is most noticeable in the poorest land. On new land, and on land well manured, the sour orange grows stronger and the disease is not so severe. Partial shading of the young seedling with growing plants such as Cassava, papaw and bananas is being tried on several beds.

32. *Limes.*—Owing to frequent rainy weather throughout the year and the consequent prevalence of withertip (*Gloeosporium limetticolum*), a large number of the lime seedlings which were put in bamboo pots did not grow to the height required for planting on estates, these are being planted out in the open ground for sale later as " bare-root " plants. Young plants will be potted from the nursery beds for sale in 1933.

33. *Loan of Propagators.*—Several estates which have grown their own stock plants have been granted the loan of men trained in budding. Of the total number of citrus buds distributed 29,403 were for local use.

34. *Donors.*—The Department is indebted to the following persons and institutions for gifts of plant material :

Abroad : The Director of Kew; Departments of Agriculture, United States of America, Cuba, Dominica, and Bermuda; the Jamaica Agricultural Society; Board of Agriculture, Fiji; Professor Juan Balme, Mexico; Dr. Fairchild, U.S.A.; Messrs. M. J. Rivero, Colombia; H. W. Johnstone, Florida; K. Biswar, Calcutta; V. L. Millin, New Zealand; C. A. O. Phillips, Grenada; and T. R. Towns, Cuba.

Local : Mesdames J. E. Seheult, R. Wilson, R. J. Foster; Dr. Laurence; Messrs. Collier Jones, G. A. Jones, and J. B. Hutchinson

35. *Chief Plant Introductions.*—The principal plant introductions were a collection of varieties of Piper nigrum from Kew, viz.: Cheriakodi, Balamcotta, Kalluvalli, and the Perrine Lemon and Avocados Dunedin, Butler, Simmonds, Collinson and Winlowson from Dr. Fairchild. All have been successfully propagated.

36. *Tomato Experiments.*—A trial plot was laid out to test the effect of pruning and spacing with several varieties of Tomato, viz.: Marglobe, Bonny Best, Profusion, John Bear, Heterosis, Earliana Langdon, Chateaurenard and Joffre. The yields except in two cases were in favour of the unpruned plants and plants spaced at 3 feet apart mostly did better than those at two feet. The variety Profusion gave the best results with an average yield of 5 lbs. 10 ozs. per plant, spaced at three feet apart, and not pruned.

37. *Educational.*—Students of the Tranquillity Training College attended regularly throughout the year for practical instruction in school gardening. A model school garden has been laid out for the purpose.

38. The following persons attended the Station for instructions in citrus work, viz.: Messrs, W. O. B. Donovan, Agricultural Officer in Charge, Grenada; F. A. Simmons, Agricultural Officer, Carriacou; H. Hutton and C. Hatt.

39. *Citrus Experiment Station.*—The results of the survey carried out by the Survey Department in 1931 places the area comprising the Citrus Experiment Station and the St. Augustine Nursery at 128 acres, 2 rods, 33 poles to which the Citrus plot of 2 acres, 1 rod, planted in 1932 must be added, making the total area 130 acres, 3 rods, 33 poles.

40. Approximately 32 acres have been appropriated for the Nursery leaving 98 acres, 3 rods, 33 poles for the Citrus Experiment Station; the new Cirtus experiments and the 1923 citrus plots occupy 52 acres, 3 rods, 33 poles of this area. The remaining 46 acres, 0 roods, 0 poles, are at present devoted to Sugar Cane and other crops.

41. The programme of experiments planned was described in last year's report and further details given in an article in " *Tropical Agriculture* " Vol. IX, No. 10, pp. 301-306.

42. *Preparation of Planting Material.*—Propagation of the planting material which was commenced in 1931, was proceeded with, and was almost completed before the close of the year.

43. All stocks were budded at a uniform height of ten inches from ground level, except those required for experiments designed to test various budding heights.

44. Tree training for the purpose of forming the main frame work of the tree consisted in training one shoot from the bud to a straight stake. When it reached a height of 30 inches from ground level, it was topped back to two feet, the aim being to get the plant to form three or four shoots arising from different nodes near the top. In practice it was found that in some cases only one shoot formed, and the plant had to be cut back a second time to force it to make a sufficient number of shoots ; in some cases there were more than the required number and they had to be reduced.

45. Every seedling in the nursery was numbered and records kept of the treatment it received and as to the size of the stock at the date of budding.

46. Scab disease was abundant on the sour orange stocks and stinging ants troublesome throughout the nursery ; scale insects also caused some damage.

47. The general conclusion as regards the behaviour of the various stocks in the nursery is to the effect that :—

(*a*) Rough lemon made much more rapid growth than any other stock and growth was fairly uniform.

(*b*) Sour orange made fairly uniform growth and stock from tree St. Clair 2, responded to budding better than any other of the other sour orange stock.

(*c*) Sweet Seville was difficult to raise and made comparatively slow growth.

(*d*) Grapefruit showed considerable foliage variation from seed and made the slowest growth of any stock.

(*e*) Sour orange and rough lemon were fairly easy to propagate by layering, sweet seville less easy and grapefruit difficult.

48. The final selection of plants for growth characters and freedom from diseases and pests was commenced on 21st June.

49. *System of Labelling.*—Each tree bears an aluminium label, for example M.O. 35 ; the first letter denotes the initial letter of the scion, the second the stock, followed by the serial number of the tree, thus M=Marsh, and O=Sour Orange. This system is uniform throughout the experiments.

50. The plots in the experiments bear a serial number in Arabic numerals except where they are divided into sub-plots in which case the latter bear the serial number. In certain experiments laid out on the Latin Square system the plot is also identified by a Roman numeral and where the plots are divided into sub-plots it is shown by a letter thus, IIIA.

12

51. The Manager, Mr. L. A. Brunton reports on the work of the Station as follows :

52. *Preparation of the Land.*—The work of preparing the land for the Citrus Experiments, which was commenced at the end of 1931, was completed this year, with the exception of about one acre. The total cost of this work which consisted of reforming the fields by draining, levelling and round-ridging amounted to $403.23 and $1,290.59, respectively, which represents an average cost per acre, respectively, of $7.94 and $25.42.

53. *Planting.*—Planting commenced on June 21st when the first tree No. 72 was planted by the Director, and ceased on December 8th, a total of 2,113 trees having been planted during this period, leaving a balance of 204 to be planted in 1933. The cost of planting amounted to $278.46 an average of 13.17 cents per tree.

54. Planting boards were used to keep the position of the trees in the soil at a uniform level. The pickets were lined down the centre of turtle back beds and the trees planted on mounds six inches high, the top lateral roots being level with the surface of the mound

55. Particulars as to the progress of planting at the close of the year are shown in the following table :

Citrus Experiment Plots.

Experiment.	Date Planted.	Area.	No. of Trees.		Total No. of trees
		Acres.	Planted.	To be Planted.	
I. Stocks for Grapefruit ..	Oct. 3-6.	3.966	180	12	192
II. Comparison of Stocks for growth and disease resistance	Sept. 8-12	2.066	133	11	144
III. Height of bud insertion for Grapefruit	Nov. 1	.991	43	5	48
IV. Root selection	Sept. 1	.351	17	—	17
V. Cultural treatment ..	Aug. 23-Sept. 1	5.950	288	—	288
VI. Manurial treatment ..	June 23-July 18	11.903	576	—	576
Guard rows in Manurial treatment	June 25-Nov. 18	11.962	579	—	579
Other Guard Rows ..	Nov. 16-Nov. 17	1.053	51	—	51
VII. Stocks for oranges	Nov. 30-Dec. 3	2.754	114	78	192
Guard rows oranges	Dec. 12	1.658	12	98	110
VIII. Height of bud insertion for oranges	Dec. 7	.688	48	—	48
General Cultivation	Nov. 26-28	1.487	72	—	72
		44.829	2,113	204	2,317

56. *Pests and Diseases.*—Parasol and small black stinging ants gave much trouble. The former were destroyed before very serious damage was done, but control of the latter was far more difficult. A fair measure of success was attained by the use of "Argentine ant syrup", but it takes several days to destroy a nest by this means. Gum exudation from the stems of a few trees suggested gummosis, but it appeared later to be probably due to some mechanical injury; eighteen trees died and were supplied.

57. The results of a trial of a commercial oil emulsion in comparison with resin wash were distinctly in favour of the former. Scale insects were apparently killed after the second application of the oil emulsion, whereas after two sprayings with resin wash many scales were still alive.

Citrus Variety Trials, 1923.

58. This plot is very severely attacked by gummosis, every tree being affected with the exception of Valencia, of which only six trees of the eighteen are attacked. Nine trees died during the year. Measures have been taken to inarch new roots to all the trees, and the question of draining is under consideration.

59. The total yield of fruit for the year amounted to 47,885 oranges and 31,967 grapefruit, but as 8,128 and 6,524, respectively, were dropped fruit, the actual saleable fruit amounted to 39,757 oranges and 25,443 grapefruit.

60. The following return shows the average number of fruits per tree reaped from each variety:—

Yields.—Average Number of Fruit Per Tree.

Grapefruit.				Oranges.			
Marsh.	Foster.	Walters.	Duncan.	Jaffa.	Parson Brown	Valencia.	Navel.
399	282	363	384	637	1,053	528	140

61. The expenditure on this plot for the year amounted to $256.20 and the receipts to $621.86.

Sugar Cane.

62. The crop yielded 1,035 tons. 0 cwt. 3 qrs., loss in weight in transport amounted to 20 tons 1cwt. 1 qr. slightly less than two per cent., payment was, therefore, received for 1,014 tons 19cwt. 2qr.

63. *New Varieties.*—A new variety of C.P. 807 was introduced from Porto Rico in February; from these 14 plants were grown and from the stools thus secured an extension approximating a third of an acre was made in October to November.

Bananas.

64. Cultivation of five acres of Governor bananas planted in June and July 1931 was conducted along the usual lines of cutlassing, weeding and moulding the stools, pruning was undertaken sufficiently often so as not to leave more than three plants in different stages of growth, to each stool.

65. Reaping commenced in March and 2,378 stems were reaped by the end of the year, an average of 475 stems per acre. A classification of these shows that 73 per cent. of the stems were seven hands, 15 per cent. eight hands and only slightly over one per cent. nine hands.

Other Crops.

66. The following crops also received attention during the year.

67. *Rice.*—Small trials were made with various varieties of Upland and Swamp rices. White Vintula proved the best of the Upland varieties with a yield calculated at 8.3 barrels per acre. With the swamp varieties the highest yields were obtained from A.H.C. and Ngasein with 18 barrels each.

68. *Pigeon Peas.*—The Trinidad pigeon pea selected for the character of ripening all its seed together seems now to be a definitely established strain. The planting of progeny rows from the heaviest bearing plant with this character continues, the estimated yield being 3,000 to 4,000 lb. of dry seed per acre. The White Hawaiian continues to retain its white character; its maximum yield will probably not exceed 2,500 lb. per acre. The Dwarf pigeon pea appears to be losing its dwarf character.

69. *Cover Crops.*—The season proved particularly unfavourable to crops grown from seed. Twenty-three varieties were again planted; the best of the late introductions being Calopogonium coeruleum.

Minor Crops.

70. *Grapefruit.*—The Co-operative Citrus Growers' Association closed their first season's operations on June 30th, having packed for the year ending on that date, 10,700 boxes of Grapefruit and 1,566 boxes of Oranges. Good prices were obtained for most of the grapefruit and market opinions on the quality were generally favourable. Consideration was given to the equipping of the packing house for canning and pre-cooling, assistance being given in the preparation of the estimates and in preparing an application to the Colonial Development Fund for a free grant to cover the cost of same.

71. Experimental consignments of grapefruit juice have been made.

72. The Department has kept in close touch with the work of the Association by providing an expert to supervise the packing house, and by representation on its Board of Directors; twenty-seven regular meetings were attended.

73. Assistance was given in the preparation of a cinema film of the industry.

74. The crop commencing November 1932 is an early and short one, undoubtedly due to the unseasonal wet weather during the early months of the year. The trees set an early crop from the March flowering and produced few or no flowers at the normal flowering period in June.

75. Planting is extending rapidly. It is estimated that the plants distributed from the Government nurseries will cover about 210 acres. Besides these a considerable number is grown by estate proprietors for their own use, and by certain small nurseries for sale. An approximate estimate of the acreage from the two latter is 140. The Colony's acreage at the present time may, therefore, be placed at approximately 885.

76. *Seedling or "Cacao" Oranges.*—A report as to the export value of this crop was made to the Board of Agriculture on May 10th and is published with the minutes of the meeting.

77. Seedling oranges are variable in character, and, grown as they are in Trinidad, mostly associated with other crops, conditions are not conducive to the production of good marketable fruit. It is possible to market a small quantity at a profit through the Co-operative Citrus Growers' Association, but the extension of seedling oranges with a view to an export trade is not advised.

78. The importance of developing a trade in oranges, if possible, has received considerable attention. The large supplies of Mediterranean fruit, the marketing season of which coincides with ours, have always made the results problematical. The Department has consequently never been able to recommend the development of orange planting, even of budded varieties, for the purpose of an export trade.

79. *Hybrid Limes.*—Investigations were continued in an effort to produce a lime resistant to withertip and of commercial value.

80. *Yields of T. 1 Hybrid.*—A half acre block planted at St. Augustine, July to September, 1929, has cropped continuously since April 1931 when bearing commenced.

	1931. *lb.*	1932. *lb.*
January	—	239
February	—	635
March	—	419
April	24	907
May	27	170
June	205	990
July	46	538
August	238	1,082
September	198	1,279
October	202	1,226
November	223	756
December	338	934
Total	1,501	8,175

In barrels of 160 lb. per acre this is equivalent to :

Year.	*Barrels.*
1931	18.76
1932	102.19

81. *Factory Analysis and Market Reports.*—Mr. A. Embleton, M.SC., A.I.C., of Messrs. Alston & Co., Ltd., kindly undertook the crushing and distillation of two samples of T.1 limes and he reported as follows :

	Sample examined 16th June, 1932	*Sample examined 9th Sept.*, 1932.
Weight of limes received ..	742 lb.	760 lb.
Juice obtained	32.2 gals.	34.6 gals.
Juice per barrel of 160 lb limes ..	6.75 gals.	7.3 gals.
Citric Acid per gal.	11.13 oz.	11.7 oz.
Oil obtained on distillation ..	2 lb. 3oz.	2 lb. 3 oz.
Yield of oil per barrel of limes ..	7.5 oz.	7.4 oz.

82. The average factory yield of lime oil over an entire season is stated to be 6.75 oz. per barrel of limes and an acidity of juice approximating 12 oz. per barrel.

83. A report upon the nine samples of distilled and hand-pressed West Indian and T.1 lime oils sent to the Imperial Institute in October 1931 was received in April.

84. The report on most of the samples was unfavourable and it was suggested that the odour and quality of the oils had suffered in transit owing to the bottles not being completely filled, with the result that some oxidisation had taken place.

85. A further sample of both T.1 (A) and West Indian (B) lime oils were forwarded to the Imperial Institute in June. The portion of the report dealing with the commercial value and remarks on the samples is quoted below.

Report from the Imperial Institute.

86. *"Commercial Value".*—The oils were submitted to the same two London firms, (*a*) brokers, and (*b*) essential oil distillers, who were consulted in connection with the earlier samples which were the subject of Imperial Institute report dated 11th April, 1932. They furnished the following reports respectively :—

(*a*) The analytical figures are all consistent with a good merchantable quality of distilled lime oil. We should have no difficulty in getting market value for either of these qualities. At present they should be worth about 30s. per lb. but the new crop is imminent and we fear that this high level may not be maintained.

The firm also mentioned that the odour of (B) is better than that of (A).

(*b*) The characters of both of these oils may be said to be within the recognised limits. The rotation of (A) is a little lower than usual. The characters of (B) are typical of the usual commercial oils. Both possess good flavour, (B) being superior to (A).

87. *Remarks.*—The results of the Chemical examination showed that the constants of sample (B) correspond to those of ordinary commercial distilled lime oil. In the case of sample (A) the percentage of aldehydes is slightly outside the range of the usual constants of the commercial oil.

88. Both oils possessed an agreeable odour and no appreciable difference in their intensity could be observed. The aroma of sample (B), however, was rather more refined than that of sample (A). The odour of the latter (distilled from the T.1 limes) was considerably stronger and more pleasant than the sample of oil previously received as distilled from this hybrid lime and consignments of similar character would be readily marketable".

Reports from New York.

89. Reports from two New York firms to whom similar samples were submitted on the suggestion of Mr. E. Gransaull were not favourable, the odour and flavour being considered inferior to that of the West Indian type.

90. Another report on further samples of West Indian and T.1 oils from one of the same firms states that on analysis and comparisons with usual stock it was found that in chemical characteristics neither sample comes within the range which they have established as a result of years of experience. The West Indian was stated to be better and stronger than T.1 but even that is somewhat inferior in odour and flavour to the type their customers prefer. They consider both oils were better than the previous sample of T.1.

91. Several experimental shipments of T.1 fruits, packed in 20 lb. Tomato lugs, were sent to Canada and England towards the close of the year for market valuations and reports.

Bananas as an Export Crop.

92. Investigations commenced in 1931 with the object of developing a trade in bananas, were continued. All phases of the crop from planting to marketing were studied. Roadside meetings were held, and planting demonstrations given, for the purpose of showing methods of cutting, handling and transporting the fruit.

93. Several shipping companies were approached for the purpose of obtaining suitable transport facilities. Thanks are due to Messrs. F. Leyland & Co., Ltd., for kindly allowing free freight on four experimental shipments to England and to Messrs. Furness, Withy, Ltd., for free freight on two shipments to New York.

94. *Cavendish or Governor.*—The experimental plots detailed in last year's report were kept under observation. One was abandoned in April and another, the St. Augustine plot, was considerably damaged by an outbreak of disease.

95. The returns of crop show a high percentage of bunches below eight and nine hands. This may partly be accounted for by poor and variable planting material, but in the main it is disappointing and shows that much more manuring will be necessary to produce bunches of nine hands and over.

96. The results are all the more disappointing as the rainfall during the early months of the year was unusually favourable for bananas, but against this is the fact that the experimental plots were all in the lower rainfall zones and trials in the wetter portions of the island might be expected to have done better.

97. A total of 557 bunches of fruit of this variety, divided into five experimental shipments, were sent to the English market. Subsequent reports were to the effect that the fruit was not to be compared with Gros Michel, being mostly too small and too thin, and the bunches mostly cut up into second and third grade fruit. It was stated that the Cavendish variety would be quite acceptable to the trade provided much larger stems and fingers could be shipped, and unless this could be done further shipments were not recommended.

98. The financial results, examined from a commercial standpoint, show that a loss varying from 10-56 cents per bunch would have accrued on the five shipments.

99. *Gros Michel.*—During the investigations with Cavendish bananas the possibility of developing an export trade in the Gros Michel, by planting small patches in suitable places, has been borne in mind. There is the nucleus of such an industry, chiefly in Toco, Guaico-Tamana, Biche, Rio Claro and Rock-Penal districts, where supplies are grown for the local market. Although the danger of Panama disease cannot be overlooked, reports indicate that the scattered patches of this variety of bananas have not been seriously affected in recent years.

100. Experimental shipments with this variety comprised five shipments totalling 763 bunches to England and two shipments totalling a similar number to New York.

101. Reports from England were to the effect that the fruit was of excellent quality with large and well-shaped fingers, generally cut at the right stage of growth and equally as good as that from Jamaica and other competitive countries. Practically the only adverse criticism as regards this variety was the excessive bruise damage.

102. The reports on the fruit sent to New York were very similar and stress was laid on considerable bruising and scarring.

103. Both countries consider there are market possibilities for this variety.

104. The financial results obtained from the shipments to England showed that the maximum obtained was sixteen cents per bunch for any shipment after making allowance for freight at forty-eight cents. On the other four shipments to England calculated on the same basis, the fruit would have been worth the grower half a cent, eight and a half cents, five cents and eleven cents per bunch, respectively.

105. *General Remarks on both Varieties.*—The firms to which the bananas were consigned for marketing have pointed out that overhead charges might be reduced with large consignments, the same applies to local charges. There is also the question of freight rates to be negotiated.

106. It should be stated that the market price of bananas for the months in which the shipments were made was poor; later advice suggests a distinct rise in the market.

107. *New Types of Bananas.*—The Brazilian Banana *d'agua* or *Ananaica,* was received at the Imperial College of Tropical Agriculture during the year where the plants were kept under observation for some time; three plants were later handed over to the Department.

108. Plants of the Cavendish variety imported by the Imperial College of Tropical Agriculture, through Kew, from the Canary Islands were presented by the former.

109. The Giant Governor has fruited at St. Augustine and fruit were handed over to the Imperial College of Tropical Agriculture for ripening tests. The variety is apparently very similar to Congo but is not regarded as being identical with it.

Cashew.

110. This nut is abundant in certain parts of Trinidad. It grows more or less wild in certain dry hillsides and savannah situations. It has potentialities as an export crop, and a committee was appointed by the Agricultural Society to make enquiries. These investigations were not completed at the close of the year.

111. The area under Cashews, as estimated from reports by the Agricultural Advisers, approximates 627 acres, exclusive of scattered trees, of this area about 600 acres are stated to be in bearing.

112. Individual records of sixteen trees, growing upon Knagg's Hill were kept.

113. Considerable variation in yield was established, 8 trees yielded over 1,000 fruits the highest individual yield being 1,892. The yields of those giving less than 1,000 per tree ranged from 119 to 661.

114. The number of fruit required to furnish one pound of unroasted kernels ranged from 227 to 498 and the percentage of kernel to fruit from 24 to 47.8 per cent. Yields per tree ranged from half a pound to five and a half pounds and calculated on an acre basis, from 37.5 to 420 lb.

Tung Oil.

115. Plants of both *Aleurites Fordii* and *A. montana* were distributed to fourteen estates in 1931. Reports as to the growth of these are to the effect that *A. Fordii* is a complete failure and that *A. montana* has made fairly good growth. At the St. Augustine Experiment Station for example, of the twenty plants of *A. montana* planted, 12 are over six feet in height, the tallest being 12 feet.

Miscellaneous.

116. *Visits to Estates.*—Estate work, principally in connection with the development of the Grapefruit and Banana industries, was considerable and covered the usual enquiries as to choice of land for orchards, cultural and manurial treatment and control of pests and diseases.

117. *Visit to Tobago.*—A visit was paid to Tobago during the period February 5th to 8th for the purpose of attending a show organized by the Leeward District Agricultural Society.

118. *Visit to Grenada.*—I spent the period May 16th to 31st in Grenada the main purpose of my visit being attendance at a teachers' conference, at which I delivered two lectures entitled "Principles of Agriculture as a School Subject" and "The School Garden".

119. Other work undertaken during my stay was inspection of school gardens, advice on grapefruit cultivation to various estate proprietors, and inspection of the Botanic Gardens and Experiment Stations. I gave a lecture to the Agricultural Association dealing with the main purposes of my visit.

120. *Gardening in the Tropics.*—A revised edition of this booklet, first published in July 1925, and now out of print, was prepared and submitted to the Government Printer.

121. *Circular from Kew Relating to Cultivated Crop Plants in Tropical and Sub-Tropical Colonies.*—The forms were filled in and returned to Kew in April.

122. *Demonstrations at St. Augustine.*—The students of the Imperial College of Tropical Agriculture were given a demonstration in nursery work and propagation methods in April at the St. Augustine Nursery. In November they were shown over the Citrus Experiments and details of the lay-out explained to them. Mr. L. A. Brunton gave a demonstration on rubber tapping.

Herbarium.

123. *Collections and Identifications.*—A total number of 106 specimens were collected from various parts of Trinidad and Tobago during the year. Many of these were sent in by the Forestry Department for purposes of identification.

124. *Lauraceae.*—The specimens were sent to Kew for further study in connection with Mr. R. L. Brook's paper on the family.

125. *Bromeliaceae.*—The specimens of this family which were on loan to Dr. Lyman B. Smith of Harvard University were returned by him in August, and the Department is indebted to him for annotating the sheets.

126. *Selaginella.*—Thanks are due to Mr. A. G. H. Alston of the British Museum for kindly revising the material of this genus and providing a key to it. The specimens were returned in December.

127. The Directors of Kew and New York Botanical Gardens have, as in the past, kindly assisted with identifications.

Flora of Trinidad and Tobago.

128. Pressure of other important duties allowed of little time being devoted to systematic botanical work. Part V of Vol. 1 covering the concluding portion of the Rosales and the commencement of the *Myrtales*, pp. 309-332, price one shilling, was issued in August.

129. The manuscript of the *Myrtaceae* and the *Lecythidaceae* was prepared.

R. O. WILLIAMS
Economic Botanist.

REPORT OF AGRONOMIST.

For convenience my report is divided into the following sub-heads :—

I. Cacao Experiments at River Estate.
II. Marper Estate.
III. Manurial Experiments on Private Estates.
IV. General.
Coconut Wilt.
Analytical Work.

I.—CACAO EXPERIMENTS AT RIVER ESTATE.

2. The experimental work at River Estate consists of :—

(*a*) Shade Reduction.
(*b*) Distance Spacing Experiments.
(*c*) Propagation Experiments.
(*d*) Seedlings from Heavy Bearing Tree No. 4927.
(*e*) Colour of Pods Experiments.
(*f*) Manurial Experiments.

3. Results are given for the experimental year, *i.e.*, to 31st August

Shade Reduction Experiments.

4. These were started in 1910 (*a*) in Field 5, and (*b*) in Fields 20 and 21. Details of the experiments and final results for Fields 20 and 21 were reported at page 29 of the Annual Report for 1931.

5. *Results of Shade Reduction for Field 5*

(*a*) Average for 15 years (1911-25), before manuring

	Full Shade.	*Partial Shade.*	*No. Shade.*
	3.15 acres.	3.25 acres.	3.07 acres.
Lb. commercial cacao per acre per annum	.. 645	805	748

(*b*) Average for seven years (1926-32), after manuring. One and one-fifth of an acre in each section

	Full Shade.	*Partial Shade.*	*No Shade.*
Lb. commercial cacao per acre per annum	.. 502	852	719

From the above it will be seen that the *Partial Shade* plot has given the best results. These experiments are now modified and combined with manurial experiments.

Distance Spacing Experiments.

6. These consist of two sections, in Field 18, (*a*) plots planted in 1914, and (*b*) plots planted in 1922

7. **Experiments Started in 1914.**—Four plots of approximately an acre each were planted in October, 1914 with seedlings one year old, at distances of 12, 14, 16 and 18 feet apart, respectively. The seedlings were raised in bamboo pots from mixed seed obtained from heavy bearing trees of the Forastero type, producing beans of good size and quality. Immortel Shade trees were planted in the usual manner between every two rows of cacao trees.

8. *Results.*—Cropping started in 1918 and for the first six years the plot planted 12 feet apart, gave the highest yield. During the following eight years, with one exception, *i.e.*, 1929, the highest yield has been obtained for the plot planted 14 feet apart. The plot planted 16 feet apart has this year, for the first time, given the highest yield. The average yields for 15 years (1918-32), *i.e.*, from the first year of bearing are given below.

Average Yield for 15 Years (1918-32).

	12×12 ft.	14×14 ft.	16×16 ft.	18×18 ft.
	304 trees.	231 trees.	174 trees.	130 trees.
Lb. commercial cacao per acre per annum	.. 429	424	369	336

From the above it will be seen that after 15 crops the average yields for the plots planted 12 and 14 feet apart are practically the same. The crops for the plots planted at 16 and 18 feet apart have been steadily increasing during the past six years and for 1932 the crops are as follows :—

Yield for 1932.

	12×12 ft.	14×14 ft.	16×16 ft.	18×18 ft.
Lb. commercial cacao per acre per annum	638	688	698	641

The plots planted 12, 14 and 18 feet apart, respectively, show a decrease in yield on the previous years whereas, the plot planted 16 feet apart has given a slight increase. The plot planted 12 feet apart has been converted into a manurial experiment for 1933, and superphosphate of lime in varying quantities has been applied to the sub-plots.

9. **Experiments** *Started in* 1922.—Three plots of approximately one acre each were planted in July, 1922, with seedlings one year old at distances of 6, 8 and 10 feet apart, respectively, without Immortel Shade. The seedlings were raised in a nursery and each plot contains.

40	per cent of trees raised from		Tree No.	808	of Field 5.
30	do.	do.	do.	1,285	do.
15	do.	do.	do.	716	do.
15	do.	do.	do.	646	do.

These parent trees are a good type of Forastero and heavy bearers.

10. *Results.*—Cropping started in 1926. The plot planted six feet apart has given the highest yield every year up to date, but it should be pointed out that the soil,on which the trees are planted 10 feet apart is of inferior quality. The average yields for seven years (1926-32), *i.e.*, from the first year of bearing are as follows :—

Average Yield for Seven Years (1926-32).

	6×6 ft. 1210 trees.	8×8 ft. 680 trees.	10×10 ft. 436 trees.
Lb. commercial cacao per acre per annum ..	289	223	105

The above yield for the plot planted six feet apart is practically identical to the average yield obtained for the first seven crops, for the plot planted at 12 feet in the first experiment, viz., 289 against 292 lb. of commercial cacao per acre per annum.

Yield for 1932.

	6×6 ft.	8×8 ft.	10×10 ft.
Lb. commercial cacao per acre per annum ..	407	319	169

All the plots show a decrease in yield on the previous year.

Propagation Experiments.

11. The object of the experiment is to test the comparative merits on an estate scale of seedlings budded and grafted cacao trees. Six plots, of approximately one acre each, were planted in November-December, 1914. Full particulars of the experiments are to be found at page 30 of the Annual Report or 1931.

12. *Results.*—The average results for 15 years (1918-32), from the first year of bearing and for 1932, are as follows :—

	Lb. Commercial Cacao per acre per annum.	
With Immortel Shade	**1918-32.**	**1932.**
(*a*) Budded at Stake	381	695
(*b*) Budded in Nursery	347	722
(*c*) Seedling at Stake	408	670
(*d*) Grafted	368	759
Without Immortel Shade.		
(*e*) Budded at Stake.	331	698
(*f*) Seedlings at Stake	361	685

Seedlings from Heavy Bearing Tree No. 4927.

13. The average yield of this parent tree for the four years 1913-16 was 332 pods per annum. In 1917 a plot of 178 stakes was planted 12 feet apart with seed from this tree. The average yield of the progeny for nine years (1925-32) amounted to 586 lb. of cured cacao per acre. In 1932 they produced 821 lb. of cured cacao or practically five bags per acre.

Colour of Pod Experiment.

14. The object of this experiment is to try and ascertain :—

(*a*) Whether cacao trees raised from parent trees bearing yellow pods are more, or less prolific than those raised from trees bearing light red or dark red pods. The experiment is being made with seedling and budded trees respectively.

(*b*) Whether a better yield per acre would be obtained by having two trees at the same stake, one raised from trees bearing yellow pods and the other dark red pods.

This experiment is also being made with seedling and budded trees. There are two plots of budded trees. On one plot, buds from trees bearing yellow and dark red pods are on separate stock, on the other, both buds are on the same stock.

15. The plants required were raised in a nursery and planted out in July, 1921 in part of Field 25 when they were one year old. There are 50 cacao trees in each plot, spaced 13 feet apart, without Immortel shade.

16. *Results.*—The average yield for nine years (1924-32), i.e., from the first year of bearing and for 1932 are set out below :

			Lb. Commercial Cacao per acre per annum.	
			1924-32.	**1932.**
(*a*)	Seedlings from yellow pods		256	704
(*b*)	Do. light red pods		203	502
(*c*)	Do. dark red pods		234	533
(*d*)	Single bud from yellow pods		184	544
(*e*)	Do. light red pods		235	591
(*f*)	Do. dark red pods		587	1,309
		Yellow *Red.*		
(*g*)	Two buds on same stock, one yellow and one red	93 249	342	794
(*h*)	Two buds on separate stock, one yellow and one red	93 151	244	605
(*i*)	Two seedlings at same stake, one yellow and one red	46 143	189	533

Manurial Experiments.

17. The main object of the experiments is *to attempt to obtain increased yields of cacao at a profit.*—The experiments fall into four categories

(i) Experiments in co-operation with Messrs. Imperial Chemical Industries, Ltd.
(ii) Experiments in co-operation with the Cyanamid Company.
(iii) Pen Manure Experiments.
(iv) Mulch Experiments.
(v) Experiments with Superphosphate of Lime.

18. *Experiments in co-operation with Messrs. Imperial Chemical Industries, Ltd.*—These comprise (*a*) The experiments started in 1925 at River Estate. (*b*) The experiments started in 1930 at River Estate.

19. (*a*) *Experiments started in* 1925 *at River Estate.*—These were started in October, 1925, and are being made in Fields 5 and 20. Four applications of the fertilisers have been made, one in December, 1925, and the others in May, 1928, 1930 and 1932, respectively. In Field 5 the experiments are being made under full shade, partial shade and no shade conditions. The experiment in Field 20 is on a larger scale and consists of a single plot under no shade conditions, treated with a complete fertiliser.

20. *Results.*—The treatment accorded to each plot and the average profit per acre per annum, for the first five years (1926-30) after manuring, and for the next two years (1931-32) are set out below. Cacao has been valued at 10 cents per pound.

Treatment per acre, 1925, 1928, 1930 and 1932.		*Full Shade.*	*Partial Shade.*	*No Shade.*
250 lb. Sulphate of Ammonia ..	1926 to 30	Loss	$2.77	$ 6.87
	1931 and 32	Loss	Loss	17.37
250 lb. Sulphate of Ammonia 150 lb. Rock Phosphate 100 lb. Sulphate of Potash	1926 to 30	Nil.	Loss	17.69
	1931 and 32	$7.29	Loss	24.79
250 lb. Sulphate of Ammonia 100 lb. Sulphate of Potash	1926 to 30	Loss	Loss	0.32
	1931 and 32	$3.22	Loss	15.52
250 lb. Sulphate of Ammonia 150 lb. Rock Phosphate	1926 to 30	Loss	Loss	4.25
	1931 and 32	$30.65	Loss	19.65
576 lb. Sulphate of Ammonia ..	1926 to 30	Loss	Loss	Loss
	1931 and 32	Loss	Loss	$11.55
1,152 do do	1926 to 30	Loss	Loss	Loss
	1931 and 32	Loss	Loss	$3.16
1,728 do do	1926 to 30	Loss	$1.49	Loss
	1931 and 32	$0.49	Loss	$4.89

The experiments on the *Full* and *Partial Shade* Sections of Field 5, are to be discontinued. The fertiliser treatment in Field 20 consists of 250 lb. Sulphate of Ammonia, 150 lb. Rock Phosphate and 100 lb. Sulphate of Potash. The average results for the first five years (1926-30), after manuring, show a loss of $0.91 per acre, but a profit of $3.29 per acre per annum has been obtained for the past two crops (1931 and 1932).

21. (*b*) *Experiments Started in* 1930 *at River Estate.*—The object of the experiment is to *obtain information as to best time of applying a complete fertiliser to cacao trees.* The trials are also being made under full shade, partial shade and no shade conditions. Two applications of fertilisers, consisting of 250 lb. Sulphate of Ammonia, 150 lb. Rock Phosphate and 100 lb. Sulphate of Potash per acre, were made in 1930 and 1932, respectively, at the following periods :—(*a*) In January, (*b*) in May, (*c*) in September, and (*d*) in May and September, respectively, the latter being a double application.

22. *Results.*—The average yields obtained for two crops (1931 and 1932), after manuring, indicate that early application (January) is the most beneficial.

23. *Experiments in co-operation with the American Cyanamid Co.*—Trials with Ammo-phos (Grade 20/20) supplied by the above firm are being made in Fields 5 and 3A, at River Estate. Both fields are lightly shaded and the object is to test this fertiliser, both alone and in conjunction with potash. The trials for Field 5 are on single plots.

24. *Results for Field* 5.—The treatment given to each plot and the average profit per acre per annum for five years (1928-32) are as follows :—

Treatment per Acre 1927 and 1931	*Profit per Acre per Annum.*
300 lb. Ammo-phos	$2.91
100 lb. Sulphate of Potash	
400 lb. Ammo-phos	Loss
400 lb. Ammo-phos	$4.39
100 lb. Sulphate of Potash	

The profits shown above, i.e., for five years (1928-32) are slightly less than those obtained for the four years (1928-31). This is probably due to the fact that, owing to an oversight, the second application of fertilisers was made one year late, i.e., in 1931 instead of 1930 as originally intended.

25. *Experiments in Field* 3A.—The original trees in this field are not less than 60 years old. Two adjacent trees having a healthy appearance neither of them less than 20 years old, were selected, grouped together and drawn at random to form four plots of 16 trees each with a similar number of plots for control. A complete fertiliser consisting of 300 lb. Ammo-phos and 100 lb. Sulphate of Potash per acre was applied in August, 1931. The previous yields of these trees are known. The first year's results show no benefit from manuring, and it is probable that the fertiliser was applied too late.

26. *"Pen Manure" Experiments.*—These were set out at the same time as the Ammo-phos plots, in Field 5, with the object of comparing the effects of applying pen manure in three different ways to cacao trees. Pen Manure is valued at $1.20 per ton and it was applied at the rate of 15 tons per acre in June, 1927 and May, 1931.

27. *Results.*—The average results for five crops (1928-32) show that broadcasting and burying the manure is preferable to applying it as a mulch or in trenches around the trees. The former has given a profit of $4.25 per acre per annum, i.e., for the plot on which the manure was broadcasted and forked in against a loss for the other plots.

28. *Experiments with Superphosphate of Lime.*—These are being made on the plot planted 12 feet apart, of the Distance Spacing Experiments, in Field 18, on trees 18 years old. There are three treatments and three replicates of each treatment, constituting a Latin Square. There are two guard rows of cacao trees between each plot. The treatments consist of none, 450 lb. and 900 lb. of Superphosphate of Lime per acre, respectively. The first application of the fertiliser was made in May, 1932. The natural yield of the trees on each plot is known from the time the trees came into bearing. Results are not yet available.

Trenching Experiments.

29. The Trenching Experiments are being made in Fields 3A, 20 and 21

30. *Experiment in Field* 3A.—The cacao trees in this field are 60 to 65 years old, planted 15 feet apart and sparsely shaded with Immortel trees. Three plots aggregating 6.55 acres were trenched 2 feet wide by 18 inches deep, filled with all available material found on the spot and covered with earth from the trenches, from January to May, 1931, at a cost of $18.96 per acre. Two other plots consisting of 2.9 acres were similarly trenched with an addition of 18 tons pen manure per acre, from June to August, 1931, at a cost of $31.29 per acre. The *natural yield* of each plot for one year is known but no returns subsequent to the trenching are as yet available.

31. *Experiment in Field* 20.—The cacao trees are now 30 to 35 years old, planted 12 feet apart and under "no shade" conditions. A block of 2.70 acres was trenched from June to September, 1932, and heavily pen manured, at the rate of 47 tons, costing $94.07 per acre. This block is sub-divided into four plots and the *natural yield* for the block is known since 1921 but no returns subsequent to the trenching have as yet been obtained.

32. *Experiment in Field* 21.—The cacao trees are approximately 35 years old, planted 12 feet apart with ordinary Immortel shade conditions. There are three plots, aggregating 7.68 acres which were trenched from February to April, 1932, and pen manure applied at the rate of 18 tons, costing $51.05 per acre. The *natural yield* of each plot is known since 1912 but no returns are as yet available since the trenching was completed

33. *Mulch Experiments.*—Two blocks of 12 plots each have been marked out in Field 25, for mulching trials. The *natural yield* of each tree has been recorded for 1932 and they are to be kept for two years more, before starting the treatments.

34. *Natural Yield of Plots in Field* 8.—Sixteen plots containing 16 trees each, forming a Latin Square, with a guard row of cacao trees between each plot, have been laid out in Field 8 for manurial trials. The *natural yield* of each tree has been recorded for 1932 and they are being kept for another year, before starting the treatments.

II.—MARPER ESTATE.

35. *Cultivation.*—Every field on the Estate has been cutlassed twice, except Field 7 which needed only one cutlassing. In addition to this, gamelotte had to be up-rooted from a section of Field 3, where Immortel shade has been cut out for experimental purposes. Portions of Fields 1, 2 and 4 also suffered to a marked extent, for the same reason, and it was decided to postpone the shade reduction programme for this year in order to avoid further damage. Owing to the shade reduction, it has been necessary to plant a large amount of ground shade. This has been done in Fields 2 and 3, but there still remains a large amount of supplying to be done in Fields 1 and 4. The young gardens have received continued attention. A large cacao nursery has been made, with seed for specially selected pods from River Estate, for supplying vacancies.

36. *Pruning.*—Every field was more or less lightly pruned from April to June, according to the condition of the trees. The pruning of Fields 1, 2, 3 and 4, where shade has been reduced, consisted more of cutting out dead wood than actual pruning. Suckers were taken out between September and November

37. *Drainage.*—The draining of Field 10 and the vega section of Field 8 have been completed. The drains in the experimental section of Fields 1, 2, 3 and 4 have been re-opened and the earth from all drains spread.

38. *Windbreaks and Hedges.*—These have made fair growth, but it will take some time before they become effective.

39. *Witchbroom.*—All diseased tissues have been cut out once a month and burnt. During the month of May, 1932, while the intensive Witchbroom Campaign was being carried out in the district, small black pods were also picked off the trees, collected and destroyed. The total number of diseased tissues found was 213,023 or 2,287 per acre, a decrease of 15 per cent. on the previous year. The heaviest Witchbroom incidence occurred in February and March, 1932, when 44,459 and 54,637 diseased tissues were cut out and destroyed. The cost of cutting out and burning diseased material, is $6.37 and supervision $1.08 per acre.

40. The last of the specially labelled brooms, which were allowed to remain on the trees for experimental purposes, dropped on 26th June, 1932. With the exception of these brooms, mushrooms or fruiting bodies were found only on immature black pods. The results of ridding the trees of small black pods will be found under the Experimental Section.

41. *Thrips.*—Thrips appeared at the end of June. They were not as severe as in 1931 but spread over a larger area and for a longer period. They were more conspicuous where shade had been reduced for experimental purposes, in connection with Witchbroom control, and on the thinly shaded portions of the estate.

42. Cacao Beetles, squirrels and rats were scarce and easily controlled. Black pods (*Phytophthora*) were much less than in 1931. This is attributed partly to the burying of pod shells after each pick and to a lower rainfall for October to December, viz.: 25.68 inches for 1932, against 44.67 inches for 1931.

43. The rainfall on the estate for the year has been 101.73 inches against 97.34 inches for 1931, but the distribution has been much better and the highest amount for any one month was 16.11 inches in December.

44. *Crops.*—The crop reaped for the year was 33,405 lb. of plantation cacao and 1,415 lb. of black cacao and siftings. The produce is disposed of through the Cocoa Planters' Association of Trinidad, Ltd., and the plantation cacao realised $6.95 against $7.59 per fanega for 1931. The total crops (plantation and black cacao) in bags of 165 lb. for the three completed years, since the property was purchased, have been as follows :—

1930.	1931.	1932.
251	196	211

The decrease of crop is attributed chiefly to shade reduction for experimental purposes and the increase of thrips as a consequence of the shade reduction. It is estimated that the loss of crop due to matured Witchbroom pods is not more than two per cent. (*see* Experimental Section) but it is not possible to compute the percentage of small pods attacked with Witchbroom, which would otherwise have reached maturity.

45. *Buildings, Yard and Stock.*—All buildings have been maintained in good repair. A bat-proof stable, consisting of three stalls with a front gallery and a covered concrete pit for storing manure have been built. A large amount of filling and levelling of the yard between the Manager's quarters and stable has been carried out. The two mules are in good condition but one of them is very aged.

46. *Roads and Bridges.*—There are practically no crooking roads on Marper and the wooden bridges were in poor condition. During the year two re-inforced concrete bridges four feet wide and thirty feet span have been built. A road system has been started and a track 1,240 feet long by 4 feet wide has been laid out and bouldered with material obtained on the Estate.

Experimental Work.

47. The chief objects of the experiments are to ascertain the effect of the various treatments on Witchbroom incidence and on crop production. All results are given for the experimental year, i.e., from 1st September, of one year to 31st August of the following year. *Crop yields are given in pounds of commercial cacao and Witchbroom incidence in numbers of affected material per acre.*

48. The experiments may be classified under four heads :—

(*a*) Cultivation Experiments.
(*b*) Manurial and Lime Experiments.
(*c*) Spraying Experiments.
(*d*) Other Experiments.

(*a*).—Cultivation Experiments.

49. These consist of draining and shade reduction on (*a*) flat lands or vega, and (*b*) on undulating lands. Details were given in the annual report for 1930. The first and second instalments of shade trees were cut out in 1930 and 1931, respectively, but as this treatment was found to be too drastic, from a cultural point of view, no shade trees were cut out in 1932. The drains were dug in 1930 and re-opened in 1932. The average results for two years ending 31st August, 1932, are as follows :—

50. *Results on Vega.*

	50% *Shade Reduction.*		33⅓% *Shade Reduction.*	
	Crop.	*Witchbroom.*	*Crop.*	*Witchbroom.*
Drains 25 feet apart	483	5,476	411	3,156
Drains 50 feet apart	322	4,597	390	4,618
Drains 100 feet apart	211	1,764	233	1,523
No drains	215	2,258	316	2,648

(*a*) *Spacing of Drains.*—The results recorded above show that so far draining has had no effect in controlling Witchbroom. With regard to crop production, the results show that the lack of drains has adversely affected the crop.

(*b*) *Shade Reduction.*—The results tend to show that Witchbroom incidence is higher on the plots with greater shade reduction. With regard to crop production there is not much difference in the average yield for the plots on which 50 and 33⅓ per cent. of shade has been cut out.

51. *Results on the Undulating Land.*

	33⅓ *Shade Reduction.*		*No Shade Reduction.*	
	Crop.	*Witchbroom.*	*Crop.*	*Witchbroom.*
Drains 25 feet apart	367	2,658	305	1,722
Drains 50 feet apart	355	1,194	300	1,032
Drains 100 feet apart	214	1,652	425	1,174
No drains	315	2,558	381	957

(*a*) *Spacing of Drains.*—So far, these results are inconclusive, but they tend to show that the spacing of the drains has had no effect in controlling Witchbroom, on the undulating lands. It is probable that the altitude and situation of the plots have a much greater influence on Witchbroom incidence than the spacing of the drains. With regard to crop production the results are inconclusive but tend to show that, so far, draining has had no effect on crop production, on the undulating lands.

(*b*) *Shade Reduction.*—The results show that there has been less Witchbroom where no shade has been cut out. With regard to crop production, the results are inconclusive but tend to show a better yield for the Section on which No Shade has been cut out.

(*b*).—Manurial and Lime Experiments.

52. The manurial and lime trials occupy 17 acres of land, partly vega and partly undulating, under ordinary shade conditions. The cacao trees were 20 to 25 years old in 1930 and there are 250 trees to the acre. Details of the trials were given in the Annual Report for 1930. There are 25 cacao trees in each plot. The plots have been drawn at random, and there are five replicates of each treatment.

53. *Results.*—The average yields and Witchbroom incidence per acre for two years (1931 and 1932), for the five replicates, are given below, but the results have not yet been worked out.

Nitrogen Series—Vega.

Treatment per acre.	*Lb. Commercial Cacao.*	*Witchbroom.*
N_1=250 lb. Sulphate of Ammonia	370	4,502
N_2=500 lb. do. do.	356	5,888
N_3=750 lb. do. do.	390	5,446
N_0=No Manure	387	5,964

Potash Series—Undulating Land.

Treatment per acre.	*Lb. Commercial Cacao.*	*Witchbroom.*
K_1=100 lb. Sulphate of Potash	325	1,398
K_2=200 lb. do. do.	337	1,401
K_3=300 lb. do. do.	423	1,420
K_0=No Manure	289	1,636

Phosphate Series—Undulating Land.

Treatment per acre.	*Lb. Commercial Cacao.*	*Witchbroom.*
P_1=325 lb. Superphosphate	397	1,732
P_2=650 lb. do.	418	1,362
P_3=975 lb. do.	393	1,897
P_0=No Manure	328	1,517

Nitrogen and Potash Series—Vega.

Treatment per acre.	*Lb. Commercial Cacao.*	*Witchbroom.*
N_1K_1	314	5,382
N_2K_2	331	5,840
N_3K_3	348	4,906
N_0K_0 No Manure	325	5,637

Nitrogen and Phosphate Series—Vega.

Treatment per acre.	*Lb. Commercial Cacao.*	*Witchbroom.*
N_1P_1	361	4,160
N_2P_2	337	5,990
N_3P_3	341	7,107
N_0P_0 (No Manure)	269	4,500

Potash and Phosphate Series—Undulating Land.

Treatment per acre	*Lb. Commercial Cacao.*	*Witchbroom.*
K_1P_1	461	109
K_2P_2	521	221
K_3P_3	500	279
K_0P_0 (No Manure)	486	165

Complete Fertiliser Series—Undulating Land.

Treatment per Acre.	*Lb. Commercial Cacao.*	*Witchbroom.*
$N_1K_1P_1$	495	1,661
$N_2K_2P_2$	578	1,765
$N_3K_3P_3$	566	1,527
$N_0K_0P_0$ (No Manure)	464	921

Lime Series—Undulating Land.

Treatment per acre.	*Lb. Commercial Cacao.*	*Witchbroom.*
Ca_1=5 tons Pulverised Limestone	512	690
Ca_2=10 do. do.	556	849
Ca_3=20 do. do.	490	1,020
Ca_0=No lime	406	793

Lime Series—Vega.

Treatment per acre	*Lb. Commercial Cacao.*	*Witchbroom.*
Ca_2=10 tons Pulverised Limestone	409	7,719
Ca_0=No lime	365	6,262

Spraying Experiments.

54. The object of these experiments is to try and find an efficient fungicide for controlling Witchbroom leaving aside, for the time being, the question of cost. Six brooms were labelled and left on the trees, in each experiment, for ascertaining whether the various treatments would prevent mushroom production.

55. These experiments comprise :—

(*a*) Liquid sprays consisting of Agrisol, Amberene, Cooper's Fungicide, Bordeaux Mixture, Vermorite and Cooper's Bordinette.

(*b*) Dust sprays consisting of Kolodust, Kolokil, Olite Sulphur and Cupryl powder.

Liquid Spraying.

56. *Agrisol and Amberene.*—These fungicides were harmful to the cacao flowers and young fruit. Moreover, they had no effect in controlling Witchbroom and mushrooms were found on brooms and small black pods within the plots. The treatments with Agrisol and Amberene have, therefore, been discontinued.

57. *Cooper's Fungicide.*—Two plots of one acre each were sprayed with Cooper's Fungicide (1 lb. to 20 gallons water), at the rate of two gallons per tree. The plots were sprayed once in 1930, twice in 1931 and twice in 1932. Two one-acre plots are kept for control.

58. *Results.*—Crop yields and Witchbroom incidence for two years are as follows :—

			Lb. Commercial Cacao.	*Witchbroom.*
Cooper's Fungicide	E_9	1931	430	3,971
		1932	337	2,202
	E_8	1931	488	2,564
		1932	354	2,792
Control	E_7	1931	524	2,740
		1932	330	2,355
	E_6	1931	550	1,976
		1932	368	1,157

The above results show that Cooper's Fungicide has had no effect in controlling Witchbroom. Moreover, mushrooms were found on small black pods within the treated plots whereas none were found on the control plots. With regard to crop production, it will be seen that all the plots have given a smaller yield for 1932 compared with 1931, but the average decrease for the treated plots is 24.7 per cent. against 35.0 per cent. for the control plots, showing that spraying with Cooper's Fungicide has been beneficial to the crop.

59. *Bordeaux Mixture.*—Two plots of one acre each were sprayed with Bordeaux Mixture (5. 5. 50) at the rate of two gallons per tree. The plots were sprayed once in 1930, twice in 1931 and twice in 1932. Two one-acre plots are kept for control.

60. *Results.*—Crop yields and Witchbroom incidence for two years are as follows :—

			Lb. Commercial Cacao.	*Witchbroom.*
Bordeaux Mixture	E_3	1931	531	1,559
		1932	365	791
	E_2	1931	513	1,655
		1932	403	1,095
Control	E_4	1931	553	1,838
		1932	434	1,166
	E_6	1931	550	1,976
		1932	368	1,157

The above results show that two sprayings of Bordeaux Mixture per annum has had very little if any effect in controlling Witchbroom. No mushrooms were found on the sprayed plots, but one small black pod bearing mushrooms was found on Control plot E_4. With regard to crop production, it will be seen that all the plots have given smaller yields for 1932 compared with 1931, but the average decrease for the treated plots is 2.54 per cent. against 27.3 per cent. for the control plots, showing that spraying with Bordeaux Mixture has been beneficial to the crop.

61. *Cooper's Bordinette.*—A plot of one-third of an acre has been sprayed monthly from January, 1932, with Bordinette (1 lb. to 30 gallons water) at the rate of from one and a half to two gallons per tree. A plot of one acre, similarly situated, is kept for control. The cacao on these plots is poor.

62. *Results.*—Crop yield and Witchbroom incidence for 1931 compared with 1932, i.e., before spraying are as follows :—

			Lb. Commercial Cacao.	*Witchbroom.*
Cooper's Bordinette	B_5	1931	156	1,115
		1932	44	992
Control	A_5	1931	224	933
		1932	115	1,152

The plot treated with Bordinette shows a decrease in Witchbroom incidence against an increase for the control plot. No mushrooms were found on the sprayed plot, whereas mushrooms were found on the small black pods on the control plot. The results for the first year, therefore, tend to show that monthly sprayings with Bordinette have assisted in controlling Witchbroom. The crops for both plots for 1932 are very poor and show a large decrease on the previous year. This decrease is attributed chiefly to thrips

63. *Vermorite.*—A plot of one-fifth of an acre has been sprayed monthly from January, 1932, with Vermorite (1 lb. to 30 gallons water) at the rate of from one and a half to two gallons per tree. A plot of two-fifths of an acre, similarly situated, is kept for control. The cacao on these plots is good.

64. *Results.*—Crop yield and Witchbroom incidence for 1932 compared with 1931, i.e., before spraying are as follows :—

			Lb. Commercial Cocoa.	*Witchbroom.*
Vermorite	C_5	1931	619	1,157
		1932	514	1,100
Control	C_4	1931	900	405
		1932	644	748

The plot treated with Vermorite shows a decrease in Witchbroom incidence against an increase for the control plot. No mushrooms were found on the sprayed plot, whereas mushrooms were found on the small black pods, on the control plot. The results for the first year, therefore, tend to show that monthly sprayings with Vermorite have assisted in controlling Witchbroom. The crops for both plots for 1932 show a decrease on the previous year, but the decrease for the sprayed plots is less than that for the control which also tends to show that the spraying has been beneficial to the crop.

Dusting Trials.

65. *Kolodust and Kolokil.*—The dusting trials with these two sulphur fungicidal dusts, obtained from the Niagara Sprayer Co., New York, were discontinued during the year since monthly applications, made during 1931, appeared to have no effect on Witchbroom.

66. *Olite Sulphur.*—This Sulphur fungicidal dust has been imported from Messrs. W. J. Craven & Co., Worcestershire and it is being tried on—

(*a*) Plot 39 (previously Kolodust) twice a month, from September, 1931, at the rate of 20 lb. per acre for each dusting. This plot carries 171 cacao trees and the control (Plot 42) 165 trees.

(*b*) Plot 43, a block of 8.2 acres containing 2,086 cacao trees. The dust has been applied monthly, from August to October, 1931, at the rate of 13 lb. per acre. From November the quantity of dust has been increased to 20 lb. per acre. A plot of 50 trees within this block has been dusted twice a month at the same rate and six brooms were labelled and allowed to remain on the trees to observe whether they would produce mushrooms. Special care was taken to have the brooms thoroughly dusted.

67. *Results.*—Crop yields and Witchbroom incidence are as follows :—

		Lb. Commercial Cacao.	*Witchbroom.*
(*a*) Plot 39	1931	377	2,288
	1932	223	1,654
Plot 42 (Control)	1931	334	2,660
	1932	192	4,128

From the above it will be seen that the dusted plot has given a decrease of Witchbroom for 1932 compared with 1931 against an increase for the control plot. Mushrooms were, however, found on small black pods, on both plots. With regard to crop production, both plots show practically the same decrease for 1932 compared with 1931.

		Lb. Commercial Cacao.	*Witchbroom.*
(*b*) Plot 43	1931	364	3,040
	1932	241	2,428
Plot 42 (Control)	1931	334	2,660
	1932	192	4,128

The results recorded above show that there has been a decrease of Witchbroom for 1932 compared with 1931 for the dusted plot, against an increase for the control plot. Mushrooms were, however, found on small black pods for both plots and the special brooms which were allowed to remain on the trees for observation also produced mushrooms. Plot 45, which is similarly situated, might also be considered as a control for plot 43, notwithstanding that small black pods were picked off quarterly and destroyed. This plot has given an increase of Witchbroom for 1932 compared with 1931, but no mushrooms, as might be expected, were found on small black pods. So far, the results show that fortnightly and monthly dustings with Olite Sulphur have reduced Witchbroom incidence but have not prevented mushroom production on small black pods or on brooms which were allowed to remain on the trees for observation. With regard to crop production, dusting with Olite Sulphur does appear to have affected the yield, since both dusted and control plots have varied to approximately the same extent in the same direction.

68. *Cupryl Powder.*—This is a copper-lime dust, which was also imported from Messrs. Craven & Co. It is being tried on :—

(*a*) Plot 27 (previously Kolokil) twice a month, from September, 1931, at the rate of 20 lb. per acre for each dusting. This plot carries 200 cacao trees and the control (Plot 28) 135 trees.

(*b*) Plots 40 and 41 containing 772 and 163 trees, respectively. Monthly applications have been made from August, 1931, at the rate of 18 lb. per acre. Fifty trees in plot 40 have been dusted twice a month at the same rate and six brooms were labelled and allowed to remain on the trees to observe whether they would produce mushrooms. The control for these plots are E_4 and E_6, one acre each.

69. *Results.*—Crop yields and Witchbroom incidence are as follows :—

		Lb. Commercial Cacao.	*Witchbroom.*
(*a*) Plot 27	1931	651	5,040
	1932	439	5,970
Plot 28 (Control)	1931	788	6,384
	1932	368	3,264

It will be seen from above that the dusted plot has given an increase of Witchbroom for 1932 compared with 1931 against a decrease for the Control plot. Mushrooms were found on small black pods on both plots. With regard to crop production, it will be seen that the Control plot has given a larger decrease than the dusted plot for 1932 compared with 1931.

		Lb. Commercial Cacao.	*Witchbroom.*
(*b*) *Treated Plots.*			
Plot 40	1931	446	1,680
	1932	237	1,261
Plot 41	1931	458	1,422
	1932	255	1,397
Control Plots.			
Plot E_4	1931	553	1,838
	1932	434	1,166
Plot 6	1931	550	1,976
	1932	368	1,157

The figures recorded above show that both of the Control plots have given a larger decrease of Witchbroom for 1932 compared with 1931, than the dusted plots. Mushrooms were found on small black pods on one of the dusted and on one of the control plots. These results and those for Plot 27 show that dusting with Cupryl Powder has had no effect in controlling Witchbroom. With regard to crop production, it will be seen that both of the dusted plots have given a larger decrease than the control plots for 1932 compared with 1931. But opposite results have been obtained for plot 27 and they are, so far, inconclusive.

Other Experiments.

70. These consist of —

(*a*) Topping or reducing height of trees

(*b*) Drying and Dropping of brooms.

(*c*) Picking off and destroying black pods on trees.

(*d*) Mature pods affected with Witchbroom.

(*e*) Percentage of trees not affected with Witchbroom.

71. *Reducing height of trees.*—The object of this experiment is to facilitate the search for Witchbroom and reduce the cost of cutting out, also to observe the effect on crop production. One acre containing the tallest cacao trees was divided into two equal parts. The cacao trees on one of the plots were topped in July, 1930, at 12 feet, and on the other at 16 feet from ground level. Two plots of one acre each, on either side of the treated plots, are kept as controls.

72. *Results.*—Crop yields and Witchbroom incidence for two years are as follows —

			Lb. Commercial Cacao	*Witchbroom.*
Topped at 12 feet		1931	290	3,082
		1932	216	1,926
Topped at 16 feet		1931	390	1,984
		1932	242	1,600
Control	E_4	1931	553	1,838
		1932	434	1,166
Control	E_6	1931	550	1,976
		1932	368	1,157

There has been a smaller reduction in Witchbroom incidence for the plots topped at 12 and 16 feet, respectively, than for the average of the control plots for 1932 compared with 1931, so that topping the trees has not helped to reduce Witchbroom, but the cost of cutting out has been slightly less. With regard to crop production, it will be seen that both of the topped plots have given lower yields than either of the control plots for 1931 and 1932. Moreover, the percentage decrease for the topped plots is greater than that of the average of the control plots. It, therefore, appears that the yield of the topped plots, for the first two years, has been adversely affected.

73. *Drying and Dropping of brooms.*—Ten green, i.e., fresh vegetative brooms were marked on the 11th of each month, from March, 1930, for twelve months, and allowed to remain on the trees to determine the length of time which elapses before —

(*a*) The brooms turn brown or dry.

(*b*) The brooms produce mushrooms or fruiting bodies, and

(*c*) To ascertain the number of mushrooms which may be produced by one broom and incidentally the period of maximum production.

These special brooms are examined twice a day, and any mushrooms found are picked off and destroyed as they make their first appearance.

74. *Results.*

(*a*) *Drying of brooms.*—A few brooms dry up after 14 days; the majority between 20 and 28 days, others within 42 days and two brooms took 55 and 65 days, respectively, before they had dried.

(*b*) *Decay and Dropping of brooms.*—The decay and dropping of brooms depend, to a large extent, on their situation on the trees; the greater the protection from wind and drops of rain the longer they adhere to the trees. The shortest period which elapsed before a broom naturally fell off a tree was 13 days. It is not unusual for brooms to remain on trees for more than a year; 640 and 660 days, respectively, being the longest periods noticed.

(*c*) *Mushroom production.*—The shortest period before a broom produced mushrooms was 84 days, i.e., 13 weeks after the appearance of the broom. Generally, mushroom production begins shortly after the fifteenth week. Several brooms produced no mushrooms, although they remained on the trees considerably longer than 15 weeks. Out of the ten brooms labelled in November and December 1930, six and three, respectively, produced no mushrooms. Similarly, four of the brooms labelled in January, 1931, produced no mushrooms. The highest number of mushrooms produced by a single broom, before it dropped, was 283 and mushrooms may continue to be produced at the point of junction with the tree if not properly cut out. Mushrooms were produced every month of the year, but maximum production

occurred in December, January and February. A fair number was also produced in May, June and September. The table below gives the number of days which elapsed before the first and last broom dropped, before the first and last mushroom was produced and the number of mushrooms produced by each set of ten brooms, respectively.

Date Brooms marked.	First Broom dropped.	Last Broom dropped.	First Mushroom Produced.	Last Mushroom Produced.	Total Mushrooms.
1930					
(1) March	300	660	156	656	484
April	87	640	125	639	717
May	115	521	94	519	333
June	98	601	113	601	236
July	151	381	110	371	36
August	63	327	126	—	27
September ..	135	474	142	469	73
October	132	405	112	394	128
(2) November ..	91	461	183	461	180
December ..	200	408	127	398	247
1931					
January	140	494	140	481	547
(3) February ..	62	501	179	498	213

(1) Four brooms were cut out in error by the Witchbroom gang.

(2) Two brooms were broken off by an Immortelle branch.

(3) Two brooms were cut out in error by the Witchbroom gang.

75. *Picking off Black Pods.*—Apart from specially labelled brooms, mushrooms on Marper Estate have only been found on immature or small black pods on the trees and on the ground. In order to ascertain the cost and effect of ridding the trees of these black pods, a plot of four-fifths of an acre (Plot 45) was worked quarterly from December, 1930, and another plot of half an acre (Plot 44) is being similarly treated from December, 1931

76. *Results.*—The results for 1931 and 1932 are as follows :—

	Plot 45.		*Plot 44.*	
	No. of Black Pods.	*Cost.*	*No. of Black Pods.*	*Cost.*
1931—7,923	.. $5.00	—		—
1932—7,394	.. $3.75	5,915		.. $3.35

No mushrooms have been found on small black pods on these plots, but the average cost of $5.86 per acre for collecting and destroying the pods is too high for practical purposes. With a view to reducing the cost these plots will be worked only twice annually, viz.: in May and October.

77. *Per cent. Mature Pods Affected.*—Records of mature pods affected with Witchbroom were started in March, 1931, when it was observed that several pods were attacked. Plots which, owing to their situation, were expected to yield high, medium and low incidence were selected.

78. *Results.*—The results for 1931 and 1932 are as follows :—

		Total Pods.	*Pods Affected.*	*Per cent. affected.*
High Incidence.				
Plot 28	1931	6,934	230	3.32
	1932	2,951	35	1.19
Plot 44	1931	3,502	235	6.71
	1932	2,048	48	2.34
Medium Incidence.				
Plot 46	1931	4,013	97	2.42
	1932	2,606	18	0.69
Low Incidence.				
Plot 47	1931	7,691	121	1.57
	1932	4,787	7	0.15

Most of the affected pods were obtained in February, March and April. The affected pods contained an average of 40 to 50 per cent. of sound beans. From the above it will be seen that the loss of crop, due to matured pods affected with Witchbroom, has been small at Marper. More accurate data will be obtained for 1933, as a count is being made over the entire property.

79. *Percentage of trees not affected with Witchbroom.*—Witchbroom incidence and crop records are being kept for 4,289 individual trees, in the manurial section. From these records it has been possible to ascertain the percentage of trees which have not been affected with Witchbroom during the past two years, on vega and on undulating lands. The symbols N_1, K_1, P_1, &c., denote the various treatments accorded to the plots and these will be found under the manurial section. There are 125 trees under each treatment.

80. *Results.*—The percentage of trees which were not affected in 1931 and which have not been affected either in 1931 or 1932 are given below :—

Percentage of Trees not affected with witchbroom Treatments.

Series.		*Treatments.* N_1	N_2	N_3	*Control.*	*Whole Series.*
Nitrogen (Vega)	1931	4.8	4.8	7.1	4.0	5.2
	1931-32	3.2	3.2	4.8	3.2	3.6
			Ca_2			
Lime (Vega) ..	..1931	—	5.6	—	4.8	5.2
	1931-32		3.2		3.2	3.2
		N_1K_1	N_2K_2	N_3K_3		
Nitrogen and Potash (Vega)	..1931	15.2	12.0	13.6	12.0	13.2
	1931-32	13.6	8.8	8.8	10.4	10.4
		N_1P_1	N_2P_2	N_3P_3		
Nitrogen and Phosphate (Vega)	1931	11.1	6.3	7.9	10.4	8.9
	1931-32	4.2	5.5	3.9	8.0	5.5
		K_1	K_2	K_3		
Potash (Undulating)	..1931	27.0	22.2	22.0	15.6	21.8
	1932-32	16.3	12.7	13.4	9.4	12.9
		P_1	P_2	P_3		
Phosphate (Undulating)	..1931	16.4	14.6	20.6	21.1	18.2
	1931-32	9.4	10.0	9.5	7.8	9.2
		K_1P_1	K_2P_2	K_3P_3		
Potash and Phosphate (Undulating)	..1931	77.3	76.8	73.4	69.0	74.2
	1931-32	59.4	49.6	50.8	46.8	51.7
		$N_1K_1P_1$	$N_2K_2P_2$	$N_3K_3P_3$		
Complete Fertilizer (Undulating)	..1931	33.6	32.8	31.7	24.8	30.7
	1931-32	21.6	15.2	17.4	8.8	15.8
		Ca_1	Ca_2	Ca_3		
Lime (Undulating) ..	..1931	38.1	40.8	32.8	39.2	37.7
	1931-32	18.2	23.2	15.6	22.4	19.8

The figures recorded above show that the plots having the highest percentage of trees affected with Witchbroom are situated on the lowest lands and nearest to the River, i.e., the Nitrogen and Lime plots (vega) and that the plots with the lowest percentage of affected trees are on the highest elevations, i.e., the Potash—Phosphate and Lime plots (undulating land). A large percentage of trees which were not affected with Witchbroom in 1931, were affected in 1932 and *vice versa*. In several instances practically 50 per cent. of the trees not affected with Witchbroom in 1931 were affected in 1932, *vide* the Phosphate Complete Fertilizer and Lime (Undulating land) plots.

III.—MANURIAL EXPERIMENTS ON PRIVATE ESTATES.

81. These experiments are being made under the supervision of the Department of Agriculture, in co-operation with Messrs. Imperial Chemical Industries, Ltd., who supply the fertilisers, but the cost of keeping records and of applying the fertilisers is borned by the proprietors.

Manurial Experiments on Cacao.

82. The experiments on the La Vega Estate were discontinued during the year, as Messrs. Imperial Chemical Industries Ltd., intimated that they would no longer be able to supply the required fertilisers.

Manurial Experiments on Coconuts.

83. *Experiments at Endeavour Estate.*—This estate is situated at Chaguanas and is typical of a large area of old sugar cane land planted in coconuts. The soil is flat, deep, well drained and varies from a sandy loam to a clay loam. The trees are late in coming into bearing but yield an average crop of 3,000 to 4,000 nuts per acre, when they are approximately 18 years old.

84. The experiments are being made on *whole fields* whose previous cropping records are known. Details of the experiments were given in the Annual Report for 1928. They fall into two categories :

(*a*) *Sulphate of Ammonia Series.*—These were started in December, 1925. The object is to ascertain the pecuniary benefit of a normal dressing of Sulphate of Ammonia alone, and in conjunction with Potash and Phosphates.

(*b*) *Ammonium Chloride Series.*—These were inaugurated in 1928, at the request of Messrs. Nitram, Ltd., who wished to test the relative value of Ammonium Chloride and Sulphate of Ammonia as a source of nitrogen for fertilising coconut palms. Ammonium Chloride is also being tried in conjunction with Potash and Phosphates.

These experiments with Ammonium Chloride have been discontinued for the reason given above. Moreover, they have fullfiled their object. The results show that Ammonium Chloride is not a suitable substitute for Sulphate of Ammonia as a source of nitrogen for fertilising coconut palms.

85. The average annual rainfall on the estate for the past two years is 72.14 inches.

86. *Results of the Sulphate of Ammonia Series.*—All the fields have given an increased yield for the five years (1927-31) and for the sixth year (1932) above their respective *natural yields* for five years previous to manuring. But, the increase shown by the manured fields (Nos. 1, 4 and 7) is 702, 490 and 318 nuts per acre per annum for the five years (1927-31) and 930, 1,042 and 687 nuts for the sixth year (1932), respectively, after manuring, over and above that of the control field. The pecuniary results per acre per annum to date, when the produce realises $14.50 per 1,000 nuts, i.e., the average price for the five years (1927-31) are as follows :—

	Five years average 1927-31	*Sixth year* 1932
	$ c.	$ c.
Field 1 (Sulphate of Ammonia only)	6.59	9.89
Field 7 (Sulphate of Ammonia plus Sulphate of Potash) ..	2.10	10.11
Field 4 (Complete Fertilisers)	1.06	4.29

IV.—GENERAL.

Coconut Wilt.

87. A comprehensive series of experiments was started in 1931, on Waterloo Estate with a view to throwing light on the cause of the Wilt disease of coconuts. The experiments consist of :—

(*a*) Manurial Trials.
(*b*) Trimming of leaves and firing of crown of palms.
(*c*) Preserving moisture during dry season.
(*d*) Removing the crop from the palms.
(*e*) Dusting trials.

Regular inspections were made of the plots and records have been kept of wilt affected trees.

88. This work will be reported in detail elsewhere.

Analytical Work.

89. During the year a certain amount of Analytical Work, consisting of testing 245 seedling canes and 650 samples of milk from the cows at the Government Farm, was performed.

Seedling Canes.

90. *Trinidad Seedling Canes.*—The testing of seedling canes this year was confined to new seedlings raised in 1927 and to those raised in 1928 from which plot results were being obtained for the first time. As in former years the work was performed in a small improvised laboratory at the Government Farm, where the canes were crushed in a small Chattanooga mill.

91. *Seedlings raised in* 1927.—The seedlings raised in 1927 consisted of plant canes. They were tested at the end of April, 1932, when they were 18 months old. Eight of these seedlings gave better results than B.H. 10(12). The three best are T.5475, T. 5457 and T. 5468. They gave 54.45, 59.40 and 49.50 tons of cane with an indicated sucrose in the juice of 6.62, 5.94 and 5.51 tons per acre respectively. They are followed by T. 4932, T. 5456, T. 5251, T. 5118 and T. 5437 with 40.83 to 51.97 tons of cane containing from 4.69 to 5.22 tons of sucrose in the juice against 45.16 tons of cane containing 4.65 tons of indicated sucrose in the juice per acre for B.H.10(12). Twenty-five other varieties gave a yield of from 32.17 to 48.26 tons of canes containing from 3.61 to 4.52 tons of sucrose in the juice and these results are very much better than those obtained for B156, the other standard variety.

92. *Seedlings raised in* 1928.—The seedlings raised in 1928 were grown in plots for the first time and the juice tested in April, 1931, when they were 18 months old. Two varieties have given better results than B.H.10 (12), namely, T. 5535 and T. 5559. They gave 79.20 and 61.87 tons of cane with an indicated sucrose in the juice of 7.85 and 5.70 tons per acre respectively, against 51.97 tons of cane containing 5.13 tons of indicated sucrose in the juice for B.H.10(12). Seven other varieties, viz.: T. 5533, T. 5491, T. 5571, T. 5499, T. 5489, T. 5495 and T. 5509 gave 37.12 to 59.40 tons of cane containing from 3.70 to 5.01 tons of indicated sucrose in the juice, against 39.60 tons of cane and 3.68 tons of indicated sucrose in the juice for B.156.

93. *Government Farm Milks.*—Samples of the morning and afternoon milkings of each individual cow at the Farm were tested, monthly, for butter-fat content. Samples of the mixed milk supplied to Government Institutions and others were also tested. The results for the individual cows are recorded in the herd book at the Farm. The butter-fat content of the mixed milk, from January to May, 1932, was 3.18 and 4.69 per cent. for the morning and afternoon milkings respectively. I was absent on vacation leave from June to the end of the year and during that period the milks were not tested.

J. DE VERTEUIL,
Agronomist.

GOVERNMENT STOCK FARM, TRINIDAD.

General.

I proceeded to England on leave on 3rd May, returned to the Colony on 3rd December, and resumed duties at once. During my leave I spent a month at the School of Agriculture, Cambridge, attached to the staff of Mr. John Hammond, M.A.

2. The rainfall was again high this year, 81.19 inches as compared with 69.86 inches in 1931. The lowest rainfall recorded was 1.46 inches in February and the highest 11.56 inches in June.

3. With the heavy rainfall the pastures were quite green during the year and the good grazing was made full use of by again turning the dairy herd out all night as well as during part of the day. The Zebu herd remained at pasture day and night but were brought in once daily into the stanchions to be fed their concentrates as well as to be handled. There was no necessity to cut Uba cane for fodder during the Indian Summer or even at the end of the year as there was an abundant supply of grass in the fields.

Water Supply.

4. The new water supply from the St. Joseph river completed by the Public Works Department last year has worked satisfactorily but owing to the heavy floods the dam was cracked and permanent repairs will be undertaken next year.

Cattle.

5. No new cattle were imported during the year. The small herd of pure bred Holstein Friesian cattle has been maintained, and in addition to having reared several young bulls to breeding age, two local born pure bred heifers have calved. It is hoped that by selection from each succeeding generation, it will be possible to establish a hardy, better milking strain of native pure breds, suited to local conditions. The imported Sussex bull and two cows have become quite acclimatised, and two pure bred bulls, and one pure bred heifer, besides three grade bulls, and five grade heifers have been born, and are growing satisfactorily.

6. The grade Holstein-Zebu herds of $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{7}{8}$ bred cattle have been increased, with a view to having sufficient numbers of each grade to allow of a fair comparison being made, by the aid of the daily records of milk yield maintained in the dairy besides the monthly testing of milk for butter fat. A number of half and three quarter bred daughters of the pure bred Friesian bull King Butter Girl Walker, have been in-bred to their sire, resulting in the production of a very promising looking crop of calves, including $\frac{3}{4}$ bred twins (one of each sex) which have grown well. Several half bred Friesian-Zebu bulls have been produced this year, by crossing of tested Friesian bulls on heavy milking Zebu cows. This work has been referred to in an Empire Marketing Board Publication (Em. B. 58) which was circulated by the Secretary of State to all Colonial Governments on the 3rd October.

7. In addition to the pure bred Zebu herd which is kept by itself, a second smaller herd has been started with pure bred Zebu cows showing good milking qualities and dairy disposition, headed by a young pure bred Zebu bull whose mother is a satisfactory dairy cow. A second younger bull from a still better cow is already being specially cared, for carrying on this pure bred dairy Zebu herd. In this connection it is interesting to record, that since pure bred Zebus have been handled and properly cared from birth, a marked improvement in early maturity has been observed. A pure bred Zebu heifer 19 months old has actually come into oestrum, and has been served by a 20 months old pure bred Zebu bull.

8. The following bulls have been worked moderately yet regularly on the Government Farm during the year : Six pure bred Holstein-Friesian, one pure bred Sussex, two cross bred Zebu-Friesian, one seven-eighths bred Zebu-Friesian, and one pure bred Zebu. The pure bred Friesian bull King Butter Girl Walker and the pure bred Zebu bull Babool 2 have lived entirely in pasture with their respective herds, obtaining all their roughage by grazing and have been fed grain in addition. Under this system of management these two bulls have kept in satisfactory breeding condition and have proved very fertile ; thus proving this system to be the best. The working of valuable breeding bulls requires constant supervision, to avoid ill-treatment by their attendants. Pure bred Zebu bulls though excellent workers after they are broken in to work, require great patience and the breaking-in process is a long one. On the other hand Zebu-Friesian cross and half-breds have worked willingly from the first trial and appear to be equal to the Zebus in every respect. The $\frac{3}{4}$ and $\frac{7}{8}$ bred bulls have shown slightly less endurance than the lower grades.

9. Sixty privately owned cows were bred to pure bred bulls on the Government Farm during the year at a service fee of $2.00 in addition to the farm owned cows.

10. At the Annual Sale held on the 16th December, 34 grade heifers averaged $49.00 and seven grade bulls averaged $33.00. Four pure bred Zebu heifers averaged $76.50 and three pure bred Zebu bulls averaged $240.00. Two pure bred Holstein bulls were sold for $192.00 and $96.00 respectively.

11. In the Port-of-Spain area four pure bred Holstein Friesian bulls and two grade bulls of the same breeding stood for service at the Bull Service Station, Mucurapo. Two of these pure bred bulls were turned out to pasture—one at St. Ann's and one at Mucurapo—every night during the year. At the Station 30 cows were bred to pure bred bulls during the year and 175 cows to grade bulls.

12. The average number of head of cattle on the Mucurapo Pasture during the year was 60 per month and 32 per month in the case of the St. Ann's Pasture.

13. *Dairy Herd.*—The amount of milk produced during the year was 31,110 gallons or 610 gallons more than last year. The Public Institutions were supplied with 28,112 gallons.

14. The daily recording of milk yields has been carefully done during the year, and the milk has been tested for butter fat by the Agronomist once monthly.

15. *Zebu Herd.*—The following animals have been sold from the herd during the year :—

	$ c.
Two young pure bred Zebu bulls to D. A. Richards, St. Vincent	480 00
Three young pure bred Zebu bulls to Fernando Castro, Costa Rica ..	720 00
Three young pure bred Zebu heifers to H. H. Hunn	225 00
One young pure bred Zebu heifer to Namsoo	81 00
	$1,506 00

The Zebu bull " Babool 2 " was loaned to the Ste. Madeleine Sugar Co. for six months during the year and the Company sent to the Farm in exchange a young bull " Basdeo" that was previously purchased from the Farm as a yearling.

16. *Calves.*—During the year 118 cows calved. The death rate among calves was again low this year. The regular monthly dosing of calves with Copper Sulphate solution gave satisfactory results, as in the past.

17. *Health.*—The health of animals on the farm was again satisfactory ; there was no death from Paralytic Rabies. Four head of cattle were destroyed due to injuries and one died as a result of an accident. There were two deaths from old age and debility ; a heifer died from Red Water Fever and another from diarrhoea and two animals were destroyed that were suffering from tuberculosis.

Horsekind.

18. The thoroughbred chestnut stallion Bachelor's Tut foaled in 1925 by Bachelor's Double out of Miss Tut Tut that was loaned to the Farm last year by Mr. W. A. Murray was purchased for £100 early in the year. He stood for service at the Farm until the end of April when he was sent over to Tobago to take the place of the stallion K.P. This stallion was stationed in Tobago for the first part of the season and at the Farm from the end of April to the close of the season. Bachelor's Tut served eight mares in Trinidad

and K.P. nine mares. The stallion Daddy stood for service for the whole season (March to July) at San Fernando and had 21 mares bred to him. The Stallion Nelsweep was stationed at Brechin Castle Estate, Couva, for one month and at Mayaro for six weeks. Eighteen mares were bred to him—ten at Brechin Castle and eight at Mayaro. It was impossible to stand the stallion Golden Eaglet for service during the year as he was suffering from mange and later developed an acute attack of orchitis. The fee charged for the services of these stallions in Trinidad was $10.00 each. The Jack Donkey stallion Emperor 2 had 11 mares bred to him at a service fee of $7.50 each. The smaller Jack Donkey stallion Barbados Joe died on the 20th September. During the year three jenny donkeys and one mare were bred to him. His service fee was $1.00 for jennies and $5.00 for mares.

19. The thoroughbred brood mare Bois de Rose was purchased during the year and both herself and Saturnia, who foaled a filly early in the year by Daddy, were bred to Bachelor's Tut. The Saturnia filly was sold at the Annual Sale for $80.00. The brood mare Cavel had a filly foal for K.P. and is again heavy in foal for the same stallion. This foal was sold at the Annual Sale for $52.00. The brood mare Nelly was bred to Bachelor's Tut. The Constabulary mare Andiquilla foaled a filly mule during the year and was again successfully bred to Emperor 2. Her filly mule was sold for $43.00 at the Annual Sale.

Pigs.

20. Two Berkshire sows and one large Black sow were imported from Canada in April this year.

21. During the year 40 sows were bred to the pure bred boars on the Farm, at a service fee of $1.50 each.

22. At the Annual Sale 37 young pure bred Berkshire and Large Black pigs realized $349.00 or approximately $10.00 each. The highest price paid was $16.00 each for three young large Black boars.

23. Private sales of pigs during the year realised $279.50 making a total of $628.50 for all pig sales during the year.

Dairy and Mutton Goats.

24. Twenty-seven does were bred to the Saanen buck Prince Perfection during the year at a service fee of $1.50 each.

25. With a view to strengthening the herd, no goats were sold at this year's Annual Sale.

26. An Indian lop-eared buck of proved fertility was sent during the year to the Tobago Government Farm with a view to improving the size of the mutton goats in the island-ward. One of the Indian does produced triplets (3 does) sired by this buck during the year, and reared them successfully. A younger brother of this buck has been retained in the Indian herd at the Trinidad Government Farm, and has proved to be very fertile. His first born buck kid being the finest specimen of its breed produced so far on the Farm, from the point of size, bone, rapid growth, length of ears and shortness of coat.

27. During my visit to England this year, I purchased three British Alpine goats; two young bucks and a prize winning goatling, in kid. It is hoped that this breed will prove superior to Saanens under local condition, because of their dark colour, strong constitution, and easy keeping qualities, derived from a combination of the blood of the Anglo-Nubian and Swiss breeds. The three British Alpines purchased are rich in the blood of the famous Didgemere strain of 4,000 lb. a year milkers. Their names respectively are Didgemere Raven, Whitwell Dido and Bitterne Merle, and are registered in the British Goat Society's Herd Book.

28. In order to encourage the peasants to keep suitable dairy goats a Pamphlet—The Management of Dairy Goats (Shannon)—was published during the year.

Black Head Persian Sheep.

29. At the Annual Sale a pair of local born lambs were offered. The ram, one year old, was sold for $25.00 and the ewe lamb, seven months old, fetched $15.00. The two originally imported rams have kept quite fit during the year, one in Trinidad and the other in Tobago.

30. It is worthy of note that one of the Black Head Persian ewes has proved, so far, superior to all others, under identical conditions; and bids fair to become the foundation of a breed of sheep well suited to the West Indies. This ewe is very short haired, and absolutely free from wool. She keeps in show condition throughout the year, breeds regularly, and is a heavy milker, with the result that her lambs grow very rapidly and attain good size. This ewe, her first son, and all subsequent progeny are being kept in a separate flock, with a view to fixing the type by in-breeding with selection.

Poultry.

31. Eight pens (2 cockerels and 10 pullets to each pen) of pure bred poultry—White Leghorns, Rhode Island Reds and Barred Plymouth Rocks—were imported from Canada during the year and a pen of each breed was sent to the Tobago Government Farm.

32. At the Annual Sale 34 lots of pure bred poultry were sold and the amount realised was $176.75.

33. The number of eggs laid during the year was 5,131 and the revenue obtained from this source was $202.43.

Sale of Stock.

34. The Annual Sale of livestock took place on the 16th December, 1932. The attendance was quite good and the amount realized was $3,445.25, an increase of about $1,000.00 on last year's sale. Private sales of livestock amounted to $1,376.32 making a total of $4,821.57 for the year.

Pasturing and Stabling of Animals.

35. There was no general pasture at the Farm offered to the public again this year but arrangements were made for the pasturing and stabling of mares, cows and heifers sent to be bred to stallions (horse and donkey) and to special bulls. Stabling accommodation was also provided for ewes, does and sows sent here for breeding purposes. The revenue derived from the pasturing and stabling of animals amounted to $1,344.30.

Fodder Plants.

36. The stallions, brood mares and other horses were all fed grass from our fields during the whole year as there was a liberal supply. The other stock were only fed grass during the rainy season. The Constabulary horses were supplied with grass during the rainy season and with Uba chop-chop during the dry season. Small quantities of grass were also sold privately during the rainy season. The revenue from this source was $1,883.53.

37. *Uba Cane.*—As in past years thirteen acres were maintained with this form of fodder and it was fed chiefly to cattle to tide over the periods before the cutting of the seedling canes and after the sugar crop before the commencement of the rainy season. With our bigger supply of cane tops this year as well as the more abundant supply of grass due to the heavy rainfall 5½ acres of Uba cane had to be left as "stand overs" as there was no necessity to cut it.

38. *Sugar Cane.*—The Farm crop was started on the 7th March and ended on 25th April. The Factory of the Imperial College of Tropical Agriculture did not work this year and the whole crop was sold to Orange Grove Estate on the same basis as the ordinary farmer's canes. The amount sold was 905 tons and the revenue obtained was $2,610.91. Four and a half acres of old ratoons were thrown out and six and a half acres planted this year.

Coconuts.

39. The coconut plots have been treated as grass fields receiving a heavy dressing of farm yard manure during the year in place of the grass cut and carted from them during the rainy season. The nursery of dwarf coconut trees was further extended this year.

Exhibition.

40. An exhibition was held for poultry and pet stock by the newly formed Poultry Keepers Association at the Race Stand, Port-of-Spain, on the 15th, 16th, and 17th December. The poultry exhibits were of a very high standard and it was unfortunate that the attendance was so poor. It was impossible for the Farm to take part in this show owing to the Annual Farm Sale which fell on the 16th December.

Visits, Educational Work, Meetings, &c.

41. His Excellency the Governor of British Guiana visited the Farm during the year accompanied by the Director of Agriculture. Other visitors were Mr. Stockdale the Adviser in Agriculture to the Secretary of State for the Colonies; Miss Aileen Cust, M.R.C.V.S., who was on a visit of inspection to the West Indies on behalf of the R.S.P.C.A.; the Principal, Professors and students of the Imperial College of Tropical Agriculture; Mr. L. Franco, the Consul for Portugal, and Mrs. Franco, and Major Armstrong of the Armstrong Ranch, Texas, U.S.A.

42. The Naparima and the Rio Claro District Agricultural Societies visited this Institution. Arrangements were made for Sunday School children (Anglican and Wesleyan) from the Naparimas to have a day's outing at the Farm. Visits were also paid by the staff and students of the St. Joseph E.C., the Belmont Industrial and the Seventh Day Adventists' schools. Sanitary Inspectors also attended the Farm for lectures and demonstrations.

Buildings and Improvements.

43. No Works Extraordinary were carried out by the Public Works Department during the year.

REVENUE.

	£	s.	d.
Sale of Stock	1,004	9	10½
Sale of Canes	543	18	9½
Sale of Milk and eggs	3,315	9	5½
Stud Fees	226	19	7
Stabling	280	1	3
Miscellaneous	540	4	2½
	£5,911	3	2

EXPENDITURE.

	£	s.	d.
A. Personal Emoluments ..	640	0	0
B. Wages of Extra Employees—			
Storekeeper and Field Asst. ..	65	0	0
Labour	2,409	19	3½
T'dad Gov't Railway ..	25	0	0
C. Travelling and Transport Expenses —			
Travelling Manager	10	5	1½
Motor Lorry	224	14	4
E. Miscellaneous—			
Expenses of Annual Sale ..	24	19	2
Grass land Experiments ..	—		
F. Materials	349	19	10
G. Stock—Purchase and Upkeep—			
Purchase	612	9	3
Feed, Purchase of	1,379	18	0
Expenses of Stallions ..	149	17	10
	£5,892	2	10

H. V. M. METIVIER,
Officer-in-Charge, Government Farm.

REPORT OF THE VETERINARY DIVISION.

General.

During my absence on leave from the Colony (3rd May to 3rd December) the Veterinary duties were performed by Dr. J. L. Shannon, D.V.M., Assistant Officer in Charge, Government Stock Farm. This division had an extremely busy time during the year as besides the ordinary routine duties livestock had to be vaccinated on a large scale against paralytic rabies throughout the central and southern parts of the colony, and assistance had to be given to the Government Pathologist in matters dealing with the research work of this peculiar form of rabies.

2. I spent a month during my leave at the Laboratories of the Ministry of Agriculture and Fisheries, Weybridge, Surrey, working under Dr. W. H. Andrews, the Director of the Imperial Bureau of Animal Health. This officer has been investigating for some time this form of rabies that is bat transmitted and has been year, after year, causing such losses in livestock in the colony. It was also possible to visit the Institute of Animal Pathology, Cambridge, during the time I was attached to the School of Agriculture, and to discuss with Professor Buxton, the Director of the Institute, the incidence of paralytic rabies in this colony and methods to be adopted for its control. In 1931, Professor Finzi of Milan, Italy, wrote to this division for some of our rabies virus and I had the opportunity during my holiday of spending some time with him at his Laboratories to see the research work he had carried out with the virus.

3. A Committee with the Director of Agriculture as Chairman, two veterinary surgeons, four medical officers (including the Acting Surgeon-General and the Government Pathologist), one of the Wardens, an Entomologist, two representatives of the sugar and one of the cocoa industries was appointed by Government late in the year to report on the incidence of paralytic rabies in the colony as well as the best methods for controlling the disease.

4. During the year the Veterinary Surgeons Registration Board held one meeting to deal with an application for registration under Section 6 (3). The application was not entertained. Dr. J. L. Shannon,s when acting as Government Veterinary Surgeon, was appointed Chairman of the Board

5. The Veterinary Medical Association held two meetings during the year. At one of these meetings the rabies disease was discussed, and at the other the Association considered the great inconvenience Veterinary Surgeons suffered by being called upon to serve as jurors. An application for the genera- exemption of all registered veterinary surgeons in the colony was submitted by the Secretary to Governl ment but it was turned down.

6. Three meetings of the Permanent Exhibition Committee were held during the year to consider the holding of an Exhibition in which livestock form an important section early in 1933, but it was decided to recommend the postponement of the Exhibition owing to the financial position of the colony.

7. A meeting of the Animal Husbandry Committee of the Agricultural Society was held at the end of the year to consider the branding of puré bred Zebu cattle (foundation herds) which had passed the inspec- tion and for which application for registration had been made. This work had been delayed due to the fact that the Veterinary Division which is in charge of the branding was busily engaged vaccinating stock against rabies. It was decided to proceed with the branding early in 1933.

8. An ordinance with the corresponding regulations dealing with the importation of animals into Grenada and the control of diseases proclaimed by law in that Colony was submitted by me to the Grenada Government during the year at their request. Recommendations for the importation of livestock into the island of Carricaou which was given a grant from the Colonial Development Fund for this purpose were also submitted by this Division to the same Government.

Proclaimed Diseases.

9. *Anthrax.*—No cases occurred during the year. Two specimens were received for examination but they were both negative.

10. *Foot and Mouth Diseases.*—The regulations dealing with the Importation of Frozen Meat and Carcases from the Argentine, Uruguay and Brazil came into force on the 1st January, 1932, and all shipments of frozen meat which arrived in the Colony fortnightly during the year were accompanied by the necessary certificates now required by law. There were again no importations of cloven footed animals from countries where the disease exists.

11. *Swine Fever.*—The slaughtering policy which was adopted last year to stamp out this disease has given most satisfactory results as no more outbreaks occurred during the year. Suspected cases were reported from the Sangre Grande district but on investigation they proved to be due to brine poisoning. In accordance with the regulations dealing with the importation of frozen carcases no meat from swine was allowed to be landed from South American ports unless accompanied by a Veterinary Certificate countersigned by the British Consul stating that the animals were not suffering from Swine Fever at the time of slaughter and were from a district free from that disease.

12. *Glanders and Epizootic Lymphangitis.*—No case occurred.

13. *Tuberculosis.*—The testing of cattle with Tuberculin in accordance with the regulations brought into force in January 1929 had again to be discontinued during the year as the Division was busily employed in vaccinating animals against rabies. Bovine animals imported for purposes other than slaughtering were very few and in all cases they were accompanied by the necessary certificates as to tuberculin testing, &c. No animals were delayed at the port of entry for testing.

14. *Rabies.*—Fifteen dogs were imported from countries other than Great Britain and Ireland during the year (9 U.S.A., 5 Venezuela, 1 Barbados) and they were quarantined for three months at the Government Quarantine Station and for three months more at their owner's or his agent's residence provided satisfactory arrangements for this purpose had been made.

15. Two feline animals were quarantined during the year as well.

16. *Paralytic Rabies in Livestock.*—This peculiar form of rabies was again responsible for heavy losses in livestock chiefly in the central part of the island (County of Caroni) where the number of deaths was estimated to be over 500. Cases also occurred in the southern part of the island the largest outbreak being at Barrackpore. All classes of live animals were affected. A few suspicious cases were reported in dogs and one case has since been confirmed. The disease was again most prevalent in the rainy season. The bat so far is the only known transmitter of the disease in the colony and the disease has been diagnosed in eight bats. These were bats behaving in an abnormal way and they belong to either one of the following species :— *Artibeus jamaicensis palmarum*, a fruit eater, or *Desmodus rufus*, a blood sucker. In accordance with the recommendations of Dr. W. H. Andrews, the Director of the Imperial Bureau of Animal Health, and Dr. Hurst of the Lister Institute, London, a vaccination campaign was started especially in areas where the disease was occurring. A carbolised vaccine of the fixed virus of rabies was used and the brain emulsion was at first made at four per cent. This was then increased to 20 per cent., and at the end of the year it was further increased to 33⅓ per cent. This vaccine was made by the Government Pathologist and it was issued to the Division for inoculations as it became available. The peasants' animals were inoculated free of charge, but the estate proprietors were charged one shilling per dose of the vaccine. During the year about 6,000 animals were inoculated with anti-rabies vaccine, most of which was made in the colony, but some was also imported from the U. S.A. As already mentioned a special committee to report on this disease was appointed towards the end of the year and its first recommendation was that the amount of vaccine made should be considerably increased and for that purpose an assistant Government Pathologist was appointed and an emergency animal house erected at the Government Laboratories. During my leave my attention was called to the vaccination campaign which was meeting with success in the Argentine against this disease and I at once communicated with Dr. S. Quiroga of the Argentine

Government who kindly supplied this Division with most interesting literature. In that country they are using their own virus which has been fixed through passage in the horse and they make a chloroform killed vaccine with 33⅓ per cent brain emulsion (Kelse's method). It is intended during 1933 to substitute our own virus for the fixed virus of rabies and to prepare a vaccine like the above. Dr. Andrews is also carrying out experiments at Weybridge comparing the protection afforded by our virus and the fixed virus against this disease. During 1933 it is proposed to inoculate animals all over the colony whether the disease is occurring or not, and to continue this work for at least three years. The results obtained from the use of a vaccine during the year were most encouraging.

Non-Proclaimed Diseases.

17. *Bovine Piroplasmosis.*—There were no fresh importations of pure bred cattle from England, U.S.A. or Canada and consequently very few cases were seen. The dairy cattle imported from Canada two or three years ago are now immunized, but at times, especially after calving, they again become affected.

18. *Pneumonia in Calves.*—In a large dairy the death rate in calves which was due to Pneumonia was checked by placing a wooden lathed flooring in the calf pen and in this way the calves were kept much drier. This system has given wonderful results in dealing with Pneumonia in Water Buffalo calves and it is being adopted on most estates

19. *Parasitic Gastritis, Pneumonia,* &c.—With the very heavy rainfall during the year internal parasites were responsible for more trouble and the death rate in young stock was higher than in former years.

20. *Contagious Abortion in Cattle.*—Whenever the disease occurs the segregation of aborting cows for 60 days is carried out and in the larger dairies a maternity ward is established as well. There were fewer cases of the disease this year than last year.

21. *Strangles and Influenza.*—Cases were again chiefly seen in mules imported from the U.S.A. of which there were larger number imported this year than customary. In all cases they readily yield to treatment and very few developed Pneumonia.

22. *Ulcerated Lymphangitis.*—The large estates are practically free of this disease and it is only very occasionally now seen in peasants' animals.

23. *Tetanus.*—Very few cases reported.

24. *Mineral Deficiency Disease in Sheep.*—This nervous condition reported in 1931 on Constance Estate, Cedros, disappeared as soon as minerals were added to the sheep's concentrates. Towards the end of the year the supply of bone meal ran out and the mineral mixture was stopped and symptoms began to appear again in the flock. The minerals were again continued with satisfactory results.

25. *Granular sores in Donkeys.*—This condition was confined to peasants' donkeys but with early treatment recommended by this Division the disease is less seldom seen in its chronic form.

Importation of Animals.

26. The following animals were imported into the Colony during the year and inspected :—Cattle, 7,408 ; Horses, 78 ; Mules, 300 ; Donkeys, 144 ; Dogs, 53 ; Pigs, 2,308 ; Sheep, 1,066 ; Goats, 3,861 ; Domestic Cats, 4 ; Tiger Cat, 1.

27. *Quarantine Station.*—The following animals were admitted to the Quarantine Station during the year :—Cattle, 7,348 ; Mules, 4 ; Horses, 3 ; Dogs, 15 ; Cats, 2 ; Goats, 149 ; Pigs, 2 ; Sheep, 56. Seven oxen died from exhaustion and collapse after landing. One ox as well as seven goats and one sheep were trampled. One ox died from heat stroke and another from peritonitis.

28. The revenue received by Government for the services of the Government Veterinary Surgeon for inspection of animals and for the supervision of the Quarantine Station amounted to £1,360 10s.

H. V. M. METIVIER,
Government Veterinary Surgeon.

13th January, 1933.

REPORT OF THE MANAGER, RIVER ESTATE.

The year was a more favourable one than its predecessor, Revenue being £692 7s. 6½d. more and Expenditure £157 2s. 8d. less than during 1931.

Cacao.

2. The cacao crop reaped and delivered to the Cacao Planters' Association amounted to 1,325 bags of 165 lb. each which is the second highest crop ever obtained at River Estate and represents an overall average yield of 2.89 bags per acre, or slightly over 10 bags for 1,000 stakes.

3. The crops for the past 5 years have been as follows —

1928.	1929.	1930.	1931.	1932.
1,085	1,411	1,083	1,008	1,325

giving an average yield of 1,182 bags.

4. Revenue from cacao was again seriously affected by poor prices which touched a new low record and averaged only 6.44 cents per lb. for first grade produce.

5. The year was a particularly wet one without any definite dry season. While this condition apparently suited cacao and coffee it was distinctly harmful to citrus and mangoes. The total rainfall amounted to 87.01 inches which is the highest recorded at River Estate.

6. On 11th October a cacao tree in Field No. 20A was found with a small witchbroom but fortunately this was still in the green state and the specimen was cut off and destroyed before it could disseminate spores. Since then no other instances of witchbroom infection were observed until 24th January, 1933, when 13 more infected trees were observed in the same field.

7. Cacao beetles and thrips continue to increase from year to year and except on those fields which are maintained in a fairly high state of cultivation their decimating effects are much in evidence. The increase of these pests so far as River Estate is concerned is probably largely due to the very neglected condition of most of the surrounding properties on which they are totally uncontrolled. A record kept during the year reveals that a total of 22,038 adult beetles and grubs were caught and destroyed.

8. A feature of interest has been the lessened proportion of black cacao and passie during 1932 as compared with previous years. The total weight of cacao produced during 1932 was 218,793 lb. made up as follows :—211,738 lb. first grade cacao ; 5,156 lb. black cacao ; and 1,799 lb. passie. The proportion of black cacao and passie therefore works out at 3.1 per cent. The four previous years showed a proportion as follows :—

1931.	1930.	1929.	1928.
5.1	5.2	6.4	4.3

9. This I think is largely attributable to the quick burial of cacao shells which has been rendered practicable by the digging of trenches in advance of the crop season in suitable spots throughout the cultivation and heaping the cacao during reaping operations by the sides of their trenches.

10. The survey of the Estate was completed early in the year and some small scale plans are now in use while a large scale one is in course of preparation by the Survey Department.

11. A recount and sub-division of all the cacao fields was also carried out during the year and there are now 52 fields intead of 25 as formerly. The result of this recount has proved interesting from its disclosure of the extremely high death rate which persists among supplies and old trees and emphasizes strongly the great importance of constant supplying and the maintenance of a good standard of cultivation where it is hoped to maintain even a fair average yield. The following figures show the results of this recount :—

Bearing Trees.	*Half Trees.*	*Quarter Trees*	*Supplies.*	*Missing.*	*Total.*	*Acreage.*
98,003	6,195	6,468	7,237	13,854	131,757	457.5

12. The total revenue for the year was £3,246 6s. 7d. and the total expenditure £4,773 16s. 0½d. Of this expenditure a sum of £706 12s. 6d. is chargeable to Timber cultivation, crops other than cacao, and experimental work.

13. During the year an area of approximately 12 acres of bearing cacao which constituted the greater part of Field No. 19 was cleared and laid out in 36 plots of 99 stakes each for experimental purposes. It is proposed to try out on these plots the progeny of five special heavy bearing trees, seeds of which have already been planted in nurseries.

14. The cacao cultivation was maintained in good order throughout the year and besides the ordinary routine work the trenching with manure of Field No. 21 which was started late in 1931 was completed as also the " No Shade " portion of Field No. 20D. and the whole of No. 6C. Trenching without manure was proceeded with slowly in Fields Nos. 1A and 1B. Practically the whole estate was lightly pruned during the year and Fields Nos 10, 11, 12A, 13, 17 and 21 were supplied throughout. Two new concrete bridges, one with a span of 13 feet, were constructed over the ravines intersecting the road which divides Fields Nos 19 and 23. One thousand feet of new road in Field No. 22 was formed but has not yet been gravelled. All ther roads were gravelled and maintained in good order.

Citrus and Mango.

15. The Grapefruit and Grafted Mango orchards have been well maintained. Particular attention was paid to draining, round-ridging and filling of depressions, which operations are essential in the control of Gummosis. The continuous wet weather did not suit these crops and while the citrus crop was poor, mangos failed completely. Sales of oranges and grapefruit to the Citrus Growers Co-operative Association which started operations during the latter part of 1931 amounted to £124 14s. 7d. which may be regarded as satisfactory in view of the fact that the Association's activities did not cover a full year and dealt with only 29,530 oranges and 17,488 grapefruit from River Estate.

Limes.

16. The lime cultivation received the usual attention and a small extension of the cultivation was made. This crop was also very short and amounted to only 226¼ barrels of 160 lb. which realized £88 8s. 2d. There is a lime contractor whose contract is now due. This contract will be taken over during the ensuing year.

Tonca Bean.

17. The young Tonca Bean sections which are now coming into bearing yielded their first crop of consequence, viz. : 215¼ lb. of commercial beans which was sold for £41 14s. 8d. and besides this 4,900 beans were sold for plants at 60 cents per 100 which realized £6 2s. 6d., and brought the total revenue from Tonca Beans to £47 17s. 2d. During the year a trial was made with some success of layering Tonca Beans plants and some 50 such plants are being tried out under field conditions. The majority of them appear to be doing well and it is hoped by this means to obtain not only heavier bearing trees but earlier bearing results.

Coffee.

18. The Robusta coffee which is interplanted in the old cacao fields Nos. 14, 15 and 16 yielded its highest crop which amounted to 3,606 lb. but unfortunately owing to low prices this produce realized only £63 12s. 0½d.

19. The Timber plantation was maintained as usual and it is proposed soon to decide upon a definite working plan for the control of this large area. During the past year, nine more contractors were paid off and approximately another 5,000 trees added to the cultivation. This brings the total number of timber trees already paid for to roughly 55,000 ranging in age from two to fifteen years.

General.

20. *Stock.*—The stock comprising five mules, three horses, one pure bred Holstein bull and two grade Holstein cows all kept well. Both cows produced their first calves during the year—one heifer and one bull. Unfortunately, however, the young bull calf which was born on the 15th August, died on the 27th December from parasitic infestation. One of the horses is nearly twenty-three years of age and is useless. The motor lorry which is nearly five years old is fast breaking up and cannot last much longer without undergoing extensive repairs.

21. *Buildings.*—The buildings are all in a fair state of repair. During the year a new latrine was built for the labourers and the old ones were thoroughly repaired and cleaned. Repairs to the barracks, cacao houses and Manager's quarters were also carried out and a small portion of the Manager's quarters was painted.

22. *Experiments.*—Work in connection with the experimental plots has been carried out as usual and all records carefully kept. This work has been considerably increased of late with the starting of the new cacao variety trials.

23. *Statistics.*—The usual statements in connection with the working of the Estate are enclosed. In the statement showing the yields of cacao fields the old form has been discarded and the yields of the main blocks which comprise the new sub-divisions are shown. From 1933 the yield and working expenses of each sub-division will be shown separately.

RODERICK O'CONNOR,
Manager, River Estate.

RIVER ESTATE.

Statement of Revenue and Expenditure for 1932.

Revenue.	£	s.	d.
Cacao	2,862	4	1
Rent	1	14	2
Miscellaneous	361	15	10
Pasture Fees	20	12	6
	£3,246	6	7

Expenditure.	£	s.	d.
A. Personal Emoluments ..	600	0	0
B. Wages of Extra Employees :—			
Staff	447	10	0
Labour	2,663	15	6
C. Travelling and Transport ..	259	14	3½
D. Contingencies—Incidentals ..	65	10	6½
E. Miscellaneous—Timber Contracts and Improvements ..	517	1	7
F. Materials	100	5	2
G. Stock	119	18	11½
	£4,773	16	0½

RIVER ESTATE.

Record of Rainfall, 1932.

Date.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total for year.
1 ..	.07	—	1.10	—	.28	.07	—	.05	—	—	—	—	
2 ..	.09	.30	—	—	.76	.50	—	1.02	—	.12	.42	.41	
3 ..	.42	.35	.42	3.00	1.34	—	.70	.11	—	—	—	—	
4 ..	.47	—	—	.21	1.74	—	.40	.44	.10	.07	—	.09	
5 ..	.95	—	—	—	1.12	—	1.10	.66	—	—	—	.36	
6 ..	.87	—	—	.06	.44	.18	.49	1.12	.27	—	1.08	.20	
7 ..	—	—	—	—	—	.52	1.00	.34	.35	—	—	.54	
8 ..	—	.23	.92	.29	—	.62	—	.16	—	—	—	.85	
9 ..	—	—	—	—	.34	2.35	—	.47	.33	.60	—	—	
10 ..	—	—	—	—	—	.60	—	.04	—	—	—	—	
11 ..	.15	.17	—	—	—	.16	.47	—	.25	.95	.45	—	
12 ..	.04	—	—	—	—	—	—	.04	.20	.07	.10	—	
13 ..	—	.27	—	—	.12	—	—	.09	—	.15	—	—	
14 ..	—	—	—	—	.52	.35	—	1.01	.96	—	.14	—	
15 ..	.48	—	—	—	.68	.35	—	.02	—	.21	.07	—	
16 ..	.34	—	—	—	.29	.08	.40	.77	.10	.42	.81	—	
17 ..	.44	—	—	—	—	1.03	1.00	.19	—	—	.37	2.50	
18 ..	.04	—	—	—	.41	—	—	.75	—	—	—	.15	
19 ..	—	—	—	—	—	1.02	—	.10	.20	—	—	.49	
20 ..	.45	—	.30	—	—	—	.55	—	—	—	.38	—	
21 ..	.80	—	.75	—	.65	—	—	—	—	—	.77	.44	
22 ..	—	—	—	.20	—	—	.36	.05	—	.10	—	—	
23 ..	.22	—	—	—	.76	1.66	—	.47	.74	—	—	.84	
24 ..	—	—	—	.40	1.03	—	.30	—	—	1.16	—	.26	
25 ..	—	—	—	—	—	—	.27	.97	.22	.10	1.32	—	
26 ..	—	—	—	.35	—	1.50	—	2.75	—	.10	—	.24	
27 ..	—	—	—	—	—	.48	.02	.67	—	.40	.42	.75	
28 ..	—	—	—	—	.15	.39	.13	.65	—	.20	—	1.62	
29 ..	—	—	—	—	—	—	—	.06	—	—	—	.15	
30 ..	.25	—	—	—	.70	.10	.05	—	—	.43	.08	.65	
31 ..	.07	—	—	—	.03	—	.92	.46	.85	—	—	—	
	6.15	1.32	3.49	4.51	11.36	11.96	8.16	13.46	4.57	5.08	6.41	10.54	87.01 ins.

RIVER ESTATE.

Abstract of Expenditure for the year ending 31st December, 1932.

Particulars.	$ c.	$
STAFF :		
Manager..	2,160 00	
Overseer, Drivers and watchman	2,982 10	
Manager's Travelling Allowance, Messengers, &c.	446 58	5,588 68
MAINTENANCE :		
Roads, Bridges and Hedges	627 68	
Water Service and River	63 28	
Repairs to and painting of buildings	394 21	
Supplies, Tools, Bags, &c.	390 19	
Yard and Sanitation	603 07	
Pasture..	61 21	
Destruction of Vermin (Ants, Beetles, Squirrels, &c.)..	140 70	
Sundries, including Telephone rent and other Public services	479 41	
Student (Educational)	77 17	2,836 92
TRANSPORT AND STOCK		
Labour—Stock-keeper, Grass-Cutters, Maintenance Grassfield, &c. ..	526 26	
Materials—Stock feed, Repairs, Cart harness, Shoeing, Clipping, &c. ..	682 54	
Produce—Motor Lorry (including gasolene, oil, repairs, chauffeur and attendant)	1,209 99	2,418 79
NON-RECURRENT—A.		
New Roads and Bridges	225 38	
Sawing and Transport of Timber	43 34	
Surveyor and Assistant	30 65	299 37
NON-RECURRENT—B.		
Weeding and Cutlassing	7 05	
Purchase of Contracts (Cacao Contracts)	17 16	24 21
CACAO CULTIVATION.		
Draining	122 99	
Cutlassing and Weeding	2,006 33	
Pruning	1,062 96	
Supplying Cacao and Ground Shade	207 71	
Manuring, Trenching, Mulching, &c.	1,221 10	
Plant Sanitation—Digging and burning of diseased trees and burying Cacao shells	461 03	
Shade Control	76 12	
Nursery (including budding work)	89 25	5,247 49
MANUFACTURE :		
Reaping	2,371 61	
Curing and Bagging	735 38	3,106 99
FRUIT :		
Cultivation	1,073 75	
Reaping	41 35	1,115 10
COFFEE :		
Cultivation	6 80	
Reaping, Drying and Hulling	101 42	108 22
LIMES :		
Cultivation and Maintenance of Roads	236 07	
Reaping and Transport	123 81	359 88
TONCA BEANS :		
Cultivation	78 02	
Reaping	17 50	95 52
TIMBER :		
Purchase of Contracts and Advances	443 82	
Cultivation and Maintenance of Roads	447 34	891 16
EXPERIMENTAL WORK :		
Supervision	215 00	
Labour—New Experiments	583 84	
Materials	23 08	821 92
Total	$22,914 25	$22,914 25

COUNTING AND CROP RETURNS.

Field No.	Bearing Trees	Half Trees	Quarter Trees	Supplies.	Dead or Missing.	Total.	Acreage.	Appr. Age.	No. of Bags of 165 lb.	No. of Bag per acre.	Remarks.
1 A ..	2,394	215	161	40	552	3,362	11.8				Most of field trenched without manure, 1931-32.
B ..	1,145	114	117	24	377	1,777	6.2				Part trenched without manure, 1932.
	3,539	329	278	64	929	5,139	18.0	30-35	44.66	2.4	
2 A ..	1,444	247	171	179	148	2,189	11.1				Experimental Field. Replacement of poor bearers.
B ..	1,331	276	139	100	55	1,901	9.6				do. do.
	2,775	523	310	279	203	4,090	20.7	60-65	40.00	1.9	
3 A ..	1,824	361	141	196	129	2,651	13.3	60-65	28·00	2.1	Part trenched without manure, part trenched with manure, and part trenched with fertilizer, 1931.
B ..	1,572	250	67	25	291	2,205	11.3	60-65	24.00	2.1	No special treatment.
	3,396	611	208	221	420	4,856	24.6				
4 A ..	1,725	139	35	—	779	2,678	9.0				No special treatment.
B ..	2,014	70	56	—	876	3,016	10.0				do.
	3,739	209	91	—	1,655	5,694	19.0	50-60	25,33	1.3	
5 ..	2,366	179	144	174	95	2,958					Shade Fertilizer Experiments.
Over River	118	10	3	—	17	148					
	2,484	189	147	174	112	3,106	16.4	60-65	56.66	3.4	
6 A ..	2,726	68	99	21	155	3,069	10.2				To be trenched with manure, 1933.
B ..	1,849	52	76	8	218	2,203	7.3				do. do.
C ..	1,727	47	69	10	121	1,974	6.6				Trenched with manure, 1932.
	6,302	167	244	39	494	7,246	24.1	30-35	71.33	2.9	
7 A ..	2,314	112	118	50	89	2,683	8.6				Trenched with manure, 1925.
B ..	2,074	81	91	10	62	2,318	7.5				do. do.
	4,388	193	209	60	151	5,001	16.1	30-35	58.00	3.6	
8 A ..	3,557	79	306	179	214	4,335	14.5				Trenched with manure, 1927.
B ..	1,398	66	105	95	108	1,772	6.0				do. do.
C ..	1,708	66	206	171	202	2,353	7.8			..	do. do.
	6,663	211	617	445	524	8,460	28.3				
9 A ..	1,839	119	158	74	115	2,305	7.8				Trenched with manure, 1928.
B ..	1,794	60	71	9	174	2,108	7.0				Trenched with manure, 1928-29
C ..	2,461	129	138	249	137	3,114	10.4				do. do. 1929-30.
	6,094	308	367	332	426	7,527	25.2	30-35	94.66	3.7	
10 A ..	1,574	87	73	585	—	2,319	7.5				Trenched with manure, 1930-31.
B ..	2,034	107	103	533	—	2,777	9.2				do. do.
	3,608	194	176	1,118	—	5,096	16.7	30-35	55.33	3.3	
11 ..	2,233	198	169	505	—	3,105	10.3	30-35	31.33	3.0	Small portion trenched with manure, 1931.
12 A ..	2,847	132	158	122	1,369	4,628	13.8				No special treatment.
B ..	1,204	407	900	43	79	2,633	7.7				do.
	4,051	539	1,058	165	1,448	7,261	21.5	30-40	54.66	2.5	
13 A ..	2,371	105	141	185	673	3,475	14.0				No special treatment.
B ..	1,573	96	82	1	215	1,967	7.8				do.
	3,944	201	223	186	888	5,442	21.8	30-40	87.33	4.0	
14 ..	982	56	27	1	617	1,683	6.1	60-65	7.33	1.2	Part interplanted with Robusta Coffee.

Counting and Crop Returns.—*Continued.*

Field No.	Bearing Trees	Half Trees.	Quarter Trees	Supplies.	Dead or Missing.	Total.	Acreage.	Appr. Age.	No. of Bags of 165 lb.	No. of bags per acre.	Remarks.
15 ..	1,661	39	35	425	532	2,692	9.0	30-90	17.33	1.9	Part interplanted with Robusta Coffee.
16 ..	1,888	44	50	232	512	2,726	8.7	30-65	36.66	4.2	No special treatment. Very good natural conditions.
17 A ..	2,603	290	168	489	533	4,083	13.3				Part trenched without manure, 1931.
B ..	2,086	149	137	34	440	2,846	9.3				do. do.
	4,689	439	305	523	973	6,929	22.6	30.35	44.66	1.9	
18 A ..	2,722	251	161	148	90	3,372	8.5				"Distance Spacing" Experiments.
B ..	2,673	107	89	8	1,050	3,927	13.0				No special treatment.
	5,395	358	250	156	1,140	7,299	21.5	10-35	52.66	2.4	
19 ..	4,056	369	380	220	68	5,093	16.6	25-35	54.66	3.2	3,600 trees or roughly 12 acres of this field was cleared in September, 1932 for new Cacao Variety trials
20 A ..	2,089	106	140	24	92	2,451	7.9				Trenched with manure, 1926. Light Shade.
B ..	1,361	26	38	63	69	1,557	5.1				Trenched with manure, 1924. No Shade.
C ..	918	13	33	17	78	1,059	3.4				Fertilizer Experiment. No Shade.
D ..	1,084	11	29	6	124	1,254	4.0				Trenched with manure, 1932. No Shade.
	5,452	156	240	110	363	6,321	20.4	25-35	79.33	3.8	
21 A ..	1,839	96	58	221	—	2,214	7.6				Trenched with manure, 1931-32. Partial Shade.
B ..	1,787	156	71	582	—	2,596	8.7				do. do.
	3,626	252	129	803	—	4,810	16.3	25-35	34.66	2.1	
22 A ..	1,576	29	166	161	197	2,129	6.6				No special treatment.
B ..	2,442	142	288	113	279	3,264	10.2				Trenched with manure, 1925.
C ..	787	17	77	46	218	1,145	3.5				do do.
D ..	1,254	38	36	7	124	1,459	4.5				No special treatment.
E ..	1,050	10	30	3	123	1,216	3.8				do.
	7,109	236	597	330	941	9,213	28.6	25-35	90.66	3.1	
23 A ..	2,399	44	61	46	208	2,758	10.1				Trenched without manure, 1924.
B ..	804	38	56	228	90	1,216	4.4				No special treatment.
C ..	1,330	39	61	320	438	2,188	8.1				Part trenched without manure. 1929.
	4,533	121	178	594	736	6,162	22.6	25-35	61.33	2.7	
24 ..	2,163	137	111	10	430	2,851	9.2	25-35	22.00	2.3	Small portion trenched without manure, 1929.
25 A ..	963	10	2	66	123	1,164	3.9				New Mulch Experiment. No treatment yet.
B ..	2,720	106	67	179	169	2,791	9.3				Propagation, Colour and Progeny Plots.
	3,233	116	69	245	292	3,955	13.2	10-30	44.00	2.9	
GRAND TOTAL.											
Classification of Cacao Trees and number of Acres											
	98,003	6,195	6,468	7,237	13,854	131,757	457.5	—	1,325.23	2.89	

MYCOLOGIST'S REPORT, 1932.

General.

The year under review has ,in many respects, been a difficult one. Prices of staple crops have continued very low with inevitable reactions on the cultivations. This applies particularly to the permanent and long established crops. Weather conditions were somewhat abnormal during the year, there being no pronounced dry season ; and the Indian Summer was late and prolonged. The absence of an acute dry season favoured cocount cultivations in most districts in that more and better distributed rainfall is one of the principal requirements of the crop. The protracted and late Indian Summer resulted in the secondary peak of witchbroom disease of cacao being distinctly later than usual.

2. In spite of trade depression and its effects, one feels that more systematic and sustained attention should be given to sanitation of properties. The amount of damage caused by specific pests and diseases is great ; and this is increased by defective sanitary practices. It is of the first importance to conserve all possible crops and one of the best ways of doing this is to be constantly observant and active. To-day there is a big gap between knowledge of diseases and its application to crops generally.

Cacao.

3. One has to realize, that in Trinidad, cacao is grown on an extensive as opposed to an intensive basis. Practically the whole of the 200,000 acres planted in this crop is a very mixed population and the average cropping per tree is exceedingly low. Coupled with this is the very low market price of the produce. It will be seen, therefore, that in such circumstances, the control of pests and diseases is a formidable task. Agriculture is a business, and in the final analysis, economics is the determining factor. Such being the facts, the problem is : what is the best machinery that can be put into operation to deal with the situation ? The economic position of cacao being unsatisfactory at present has resulted in interest being taken in other crops and the psychological reactions are unfavourable to cacao. It is felt that the cacao crop could be materially increased if more attention was given to it. If this was done, the increased output would compensate for the low prices. At present, the several cacao districts have different complexes to encounter. One large area has a thrips (*Heliothrips rubrocincta*), Witchbroom (*Marasmius perniciosus*) and black pod (*Phytophthora Spp.*) complex ; another district has a cacao beetle (*Steirastoma depressum*) and Witchbroom complex ; and so on. In the old days it is said that the cacao cultivations in the colony commanded a labour force at the rate of one labourer to three or four acres. Now the position is very different as was evidenced by the Special Witchbroom Campaign in May last. Prominent features of that campaign were (*a*) lack of labour ; (*b*) insufficient supervision ; (*c*) in some cases, shortage of equipment. .

Witchbroom Disease.

(*Marasmius perniciosus,*)

4. This disease is steadily spreading and increasing in intensity. In addition to the centres of distribution indicated in last year's report, sporadic infestation is now known in several places in the Northern Range. Altogether, some 130,000 acres are reported as having some amount of the disease. But it must be remembered that it is only in the low-lying, high rainfall areas that the affection is severe. Up to the present, crop losses are very low and in at least 100,000 acres of the total acreage represented as witchbroom areas, no crop loss is known. The disease is known to have been present in the Island for fully five years, and it is felt that if ways and means could be devised, especially in the question of labour and supervision, then control of the trouble could be tolerably well effected. In this respect suggestions have been made (1) to institute money prize competitions ; (2) to augment the suppy of labour.

5. For the control of the affection it is recommended that two Special Campaigns should be carried out annually, (*a*) the first Campaign to be completed not later than the end of May ; and (*b*) the second Campaign to finish by the end of October.

6. These calculations are based on approximately normal weather conditions when the rains commence in June and again in November. It is all-important for purposes of checking the affection that diseased tissues be destroyed before they produce fructifications. In the very wet districts, some amount of sporophore production is operating throughout the year ; hence the need of numerous rounds being made in addition to the special work to which reference is made above.

7. Co-operation of all cacao growers is essential in controlling witchbroom. Without this, the activities of enterprising and progressive planters will be largely negatived.

Marper Estate.

8. The control work on this property has been continued in a systematic way throughout the year. It is the practice to make monthly rounds in the collection and destruction of all witchbroom tissues. The number of such tissues in 1931 was 251,099. During the year under review the number was 212,762. This shows a reduction of incidence of 15 per cent on the previous year. Of the total number of diseased tissues collected, approximately 50 per cent. of them occurred during the main flushing period in February and March. As already mentioned, the Indian Summer was late and lengthy, and this flush accounted for approximately 20 per cent. It is considered that intensive control work in handling these two peaks of incidence, supplemented by other work, is the best than can be done under the circumstances.

9. The distribution of the incidence of the disease on this estate reveals that the flat lands persistently have a much higher infestation than the elevated and undulating sections.

Mushroom Production.

10. It is interesting to note the difference in the number of fructifications during the year as compared with the previous one. The total for 1931 was 3,204 as compared with 1,250 for 1932, a reduction of nearly 40 per cent. Moreover, during the second half of the year records show that only 10 sporophores were found. This indicates the effectiveness of the Special Campaign in May and is significant because Marper had a relatively high incidence of diseased vegetative tissues towards the end of the year (*i.e.*, the Indian Summer) and the question arises : how was that infection initiated ? There is abundant evidence that the surrounding properties have far heavier infestation than Marper and there is only one conclusion, viz.: that Marper is constantly being infected from outside.

Experiments.

11. (*a*) Experiments carried out with sporophores of the parasite (*Marasmius perniciosus*) on various culture media failed to produce any secondary spores.

(*b*) In February a small area in the flat portion of the estate at Marper was reserved for testing out the sporophore producing powers of vegetative witchbroom tissues severed from the trees. For this purpose—

15 small green ' brooms '
15 large do.
15 green cushions
15 dry ' brooms '

were selected and deposited on the ground and fenced in. The weed growth was left intact to simulate the typical conditions one finds on cacao estates generally. Decay and disintegration of the tissues followed and no fructifications resulted. In July the experiment was repeated using more material and

100 small dry , brooms '
100 large do.
100 cushions
100 green ' brooms '

were deposited in the same enclosure. To-date (January, 1933) no fructifications have been seen. No conclusive deductions are yet possible from this experiment the object of which is to see if control costs of the affection can be reduced in any way.

Miscellaneous.

12. *Tonca Beans.*—The Tonca Bean (*Dipteryx odorata*) of the natural order Leguminosae, has been grown in Trinidad in a more or less scattered way for a long number of years. Up to a few years ago, however, the total acreage in this crop was comparatively small. In recent years, owing to the prevailing high prices considerable additional planting has been done. Nowadays one finds this tree being planted in nearly all parts of the colony, on virgin lands, and interplanted with other crops, with little regard for rainfall, shade, nature of soil, &c. Recently the writer has found thread blight on this crop in two separate localities in the Island. In one case the ' blight ' is assuming definitely economic importance. The fungus parasite (*Corticium Sp.*) causative of the trouble, is fairly well-known to planters as it occurs on Coffee, Cacao, Nutmegs, &c. This fungus forms slender mycelial strands on the branches and twigs ; also it forms a thin coating on the lower surfaces of the leaves. Leaves attacked in this way are killed because of respiration being inhibited. Flower panicles and young setting fruits are also attacked and killed. A certain amount of Dieback is a resultant of these attacks. In all probability in one of the cases under notice, the parasite has migrated from forest trees to the Tonca Beans and it is found that the disease is worst in proximity to the high woods where humidity is highest and where shade is dense.

13. *Control Measures.*—It is regrettable that Tonca Beans are, in most instances, too closely planted. When mature, these trees fully occupy the land even if planted 30 to 40 feet apart. In many places in Trinidad the planting distance is 20 feet or less and this is conducive to high humidity, insufficient ventilation, and these features favour the onset and development of ' thread blight '. Therefore, efforts should be made to reduce humidity by (*a*) felling all wild, non-economic trees between the Tonca beans (*b*) cutting out with care and thoroughness blighted tissues and promptly burning or burying them. If the disease still persists a supplementary control measure is periodic spraying with Bordeaux Mixture where materials and facilities are reasonably procurable. No doubt during the year 1932 owing to the absence of any marked dry season, the incidence of ' thread blight ' has tended to be high and with the advent of a normal dry season the trouble will be somewhat arrested.

14. Growers and prospective growers of Tonca Beans are advised carefully to weigh up the prospects of this crop in relation to diseases before embarking on large scale planting. So far as the writer is aware this is the first record of Tonca Beans in Trinidad being attacked by a disease of economic importance.

15. *Bananas.*—The growing of bananas has been a common feature of the colony for a long number of years. Different varieties are found as ground shade throughout the cacao estates ; and the peasantry supply a fair amount. Some years ago a small export trade was started but lack of shipping facilities brought the venture to a standstill. Recently proposals have been mooted for a revival of an export trade in this crop. It should be clearly understood that Panama disease (*Fusarium cubense*) is present in a sporadic manner probably everywhere in the Island where the Gros Michel variety has been established. Several cases of this malady have been brought to the writer's notice in this and in previous years from banana growers in widely separated parts of the Colony. Hitherto, the failure of this crop grown in cacao fields has been considered of little account—the cacao trees being the chief consideration and if a banana plant (or plants) died, alternative ground shade was resorted to and the trouble forgotten because the bananas were not regarded as a commercial crop. The result is that cacao lands generally, where the Gros Michel s abundantly grown, are infested with this soil inhabiting plant parasite. It is well established in evidence rom other countries that where Panama disease gains a footing and nothing is done to counteract it, then he land has eventually to be abandoned as a Gros Michel bearing area.

16. During the year banana growers were circularized respecting Panama disease and hints given as to treatment. A severe outbreak of Panama disease in a plot of two acres in the Diego Martin district gave an opportunity of putting to the test the feasibility of the recently recommended Gas Oil treatment of stools affected with this disease.

17. The Department is indebted to Messrs. Trinidad Leaseholds for kindly supplying a quantity of Gas Oil free of cost, for experimental tests.

18. Put briefly, there are three classes of land in the colony where bananas might be grown, they are : (*a*) *Sugar Cane Lands.*—Soil fertility is probably on the low side to produce count bunches in quantity without heavy manuring. Rainfall is low and badly distributed, and high winds, which are prevalent at many periods of the year, are inimical to good growth unless efficient wind belts are established. A series of experimental plots have been set up on the sugar estates to collect data on this subject.

(*b*) *Cacao Lands.*—Observations on these soils are recorded above.

(*c*) *Virgin Lands.*—These are, in the main, distant from roads and hence transport charges would be high and the likelihood of damage by bruising would be considerable.

19. *Coffee.*—Additional planting of this crop still continues. On the elevated lands, the arabica variety thrives best ; whilst in the lowlands robusta is promising.

20. *Diseases.*—Thread blight (*Pellicularia Sp.*) is far too common, especially on the arabica variety. The chief cause of this is excessive shade. Only rarely is a pure stand of coffee seen with its appropriate amount of shade. The usual practice is interplanting, and in most cases the shade is obviously too dense.

21. *American Leaf Disease* (*Omphalia Flavida*).—This is chiefly found on the arabica variety in the Northern Range ; but mild attacks are to be seen in the lowlands where this variety is grown. For the control of this disease reduction of shade would be generally useful.

22. *Citrus.*—The planting of citrus spp., especially Grapefruit and limes is steadily progressing. Crops were low owing to absence of a definite dry season during the period of flowering and setting of fruit.

23. Wither-tip and blossom blight (*Gloeosporium limetticolum*) of the West Indian Lime, was very conspicuous, some growers only making one-third or one-quarter of the normal crop. Planters are again warned not to plant the susceptible West Indian Lime in districts of high rainfall. Prospects of good crops on such areas are remote. But in the regions of low rainfall and with a sunny aspect, comparatively good crops are reaped in normal years.

24. The provision of adequate windbreaks is essential in Grapefruit and Orange groves. Trouble may develop in low rainfall zones in the shape of scale insects, &c., if wind belts are not efficient ; but one of the most important functions of wind-breaks is to prevent mechanical surface blemishes of fruits.

25. *Rice.*—This is a minor peasant industry in Trinidad and only in a few instances is adequate control of the water supply in a satisfactory condition for growing what is known as " swamp rice ". The absence of a properly controlled supply of water makes the growing of the crop precarious.

26. *Sclerotium Disease.*—During the year the writer's attention was drawn to an affection which was causing considerable damage in the Southern portion of the Island. The most striking feature was a rot of the stems, and the causative organism was apparently *Sclerotium oryzeae*. An abundance of small black sclerotia was present in the tissues. Lodging was common, and attacked plants more or less collapsed. Panicles were light and negligible. The internodal tissues were the worst affected. Examination of the diseased tissues revealed a multitude of small black sclerotia. The roots were unaffected. A similar disease is known in other rice growing countries and the latest and best recommendation for its control is to incinerate the rice stubble *in situ* during the dry season. Varieties resistant to this affection are known and their introduction could be tried if considered necessary.

Staff.

27. Mr. Montserin, an officer of the Department, was seconded for part time investigation of witch-broom disease of cacao in April, 1931, and for whole time work on the same subject in January, 1932.

F. STELL,
Mycologist.

INVESTIGATIONS ON WITCHBROOM DISEASE OF CACAO.

From April, 1931, the writer has been engaged in studies concerning the Witchbroom Disease of cacao in Trinidad. The first ten months of this period were spent in part-time investigations, attention being also given to work on District Service. In February, 1932, the writer was seconded for Mycological Investigations in connection with Witchbroom to which whole-time attention was devoted during the past year.

The aim of the work to be described in this paper was to carry out a series of investigations to determine what factors operate in the dissemination of Witchbroom Disease. The scope of such investigations is essentially wide, and while consideration was given to points of minor importance, attention was focussed mainly upon the question of Dormant Bud Infection.

Witchbroom infection is initiated only by the spores of the fungus, *Marasmius perniciosus*, Stahel. These spores are produced from sporophores, commonly called mushrooms, which are abundant during the rainy season. Following closely upon this period of maximum spore-production is a period of maximum production of diseased organs on cacao trees during the early dry season. However, without any apparent secondary maximum period of spore production there is a distinct secondary maximum production of diseased organs later in the dry season.

According to Stahel (*Suriname Bull.* 39. 1919, p. 28) " New buds cannot be infected during such periods because overlooked brooms cannot bear mushrooms on account of the drought. At this time many dormant buds which had been infected during the previous rainy season begin to burst and should be removed ". On the other hand Briton-Jones and Cheesman (*Tropical Agriculture*, Vol. VIII. 4, 1931) have described experiments which show that buds in a dormant condition cannot be infected by the fungus.

At the suggestion of Mr. S. F. Ashby of the Imperial Mycological Institute, the question of Dormant Bud Infection was investigated chiefly from the point of view of Cytological observations.

2.—Conditions suitable for Mushroom development.

The incidence of mushrooms on diseased organs during the dry season led to an investigation of the conditions under which they develop. From the outset it was observed that mushrooms found at this period grew from diseased organs which had fallen to the ground in the vicinity of drains and remained hidden by weeds.

Dried brooms, cushions and pods were collected and subjected to thorough wetting. One series kept in the glasshouse (Marper Estate) and watered twice daily failed to develop mushrooms. Here the temperatures recorded were probably too high, over 100°F being noted at midday. Another series kept in the open, exposed to light and air and watered twice daily also failed to develop mushrooms. In this series it is probable that intense light and the desiccating action of the wind inhibited mushroom development. A third series, protected from wind and strong light, was kept at the base of a large tree and covered loosely with green banana leaves. In this series, on the eighth day, four mushrooms (button stage) developed on one pod in a group that had been watered once daily, while 11 mushrooms appeared on two brooms and one pod in another group which had been watered twice daily. These mushrooms failed to develop beyond the button stage which was followed by decay.

Two drier brooms were placed on the side of a drain in the field and loosely covered by the surrounding weeds. They were watered twice daily until the fifth day when mushrooms began to appear. On the sixth day these mushrooms attained their full size and produced spores which germinated readily in water.

From the foregoing it will be observed that prolonged wetting accompanied by very humid atmospheric conditions and protection from desiccation and high temperatures are the most suitable conditions under which mushrooms develop.

3.—Infected leaves producing mushrooms.

In view of the fact that leaves bearing mushrooms of the fungus had been encountered occasionally it seemed desirable to investigate the importance of leaves in the production of mushrooms.

Leaves attached to dried brooms, leaves detached from dried brooms and leaves gathered from the ground beneath heavily infected trees were collected, spread loosely in shallow frames and provided with conditions suitable for mushroom development. The frames were placed on the ground protected from wind and strong light and watered thoroughly twice daily. By using banana or " Balisier " leaves as a loose covering, the cacao leaves were kept in a moist condition during the dry season. This covering was omitted during the rainy season. The results of three successive series follow :—

Date collected	Description.	No. of leaves.	Mushrooms produced.
10th April, 1931 ..	Attached	741	None
	Detached	1,000	None
	Ground	1,000	None
9th July, 1931 ..	Attached	1,515	1* 18-9-31.
	Detached	1,600	None
	Ground	1,500	None
12th November, 1931 ..	Attached	2,034	1† 5-1-32.
	Detached	2,000	None
	Ground	2,000	None.
		13,290	2

It will be observed that only two mushrooms were produced on two out of a total of 13,290 leaves used in the trial. One of these mushrooms (*) appeared on the mid rib near the petiole, the other (†) appeared on the lamina at a point, the opposite side of which was in close contact with a broom. During the period over which these trials lasted numerous mushrooms appeared on the broom to which leaves were attached. These were inspected daily and the mushrooms (button stage) removed.

In the first two series the leaves were observed for 90 days, while in the third series they were observed for 180 days, covering the period when mushrooms are particularly abundant.

4.—Period of Incubation.

Infection trials were conducted in order to determine the period of incubation of the disease, *i.e.*, the period of time between inoculation and the first appearance of symptoms. Healthy cacao seedlings from a disease-free area (St. Clair) were transferred to Marper Estate and inoculated. A series of 20 seedlings with their terminal buds showing signs of activity was inoculated each week for a period of four weeks commencing 3rd December, 1931. The results are summarised in the following table :—

Date inoculated.	No. of buds.	No. developing Witchbroom.	Incubation Min.	Period Max.
3/12/31	20	13	25 days	47 days
10/12/31	20	10	21	47
18/12/31	20	12	24	52'
28/12/31	20	8	22	42

It will be observed from the table that the minimum period of incubation was 21 days, while the maximum was 52 days. The seedlings which remained healthy were kept under observation for 148 days when they were transferred to a disease-free area and planted out in beds. The buds have since developed into healthy shoots. The controls also remained healthy.

From the data presented it is concluded that the period of incubation varies between three and eight weeks. The exact period would naturally depend upon the growth rate of the inoculated buds Thus the abundance of diseased cushions and brooms in February and March would be the result of natural inoculations which had taken place during the preceding two months.

5.—Infection trials with dormant buds.

While investigating the period of incubation, ten seedlings whose terminal buds were still dormant were selected each week and inoculated. For the four weeks 40 dormant terminal buds were inoculated. On a full-grown tree at Marper Estate, 25 dormant lateral buds were also inoculated. The inoculated buds were kept in a humid atmosphere for 24 hours. After 13 days, some of the buds commenced active growth, and by the end of 24 days all had shown signs of activity. At this stage the seedlings were transferred to a disease-free area where they were kept under observation. From time to time buds were removed, fixed, imbedded in paraffin and sectioned. Altogether 15 terminal and lateral buds were examined but none of the sections revealed the presence of fungus mycelium in the tissues. The remaining 25 terminal and 13 lateral buds developed healthy shoots.

The spore suspension and the technique employed were the same as for the inoculation of the active buds in connection with the study of period of incubation. The individuals of the previous experiment were regarded as controls in this one. It will be observed that 54 per cent. of the active buds inoculated developed diseased organs while all of the dormant buds inoculated produced healthy organs. This is in keeping with the findings of Briton-Jones and Cheesman (*Tropical Agr.* VIII) who conclude that dormant buds cannot be infected by the laying on of spores.

6.—Budding with budwood from heavily infected area.

In order to investigate further the question of dormant bud infection, budwood was taken from very heavily infected cacao trees growing in one of the worst witchbroom areas in Manzanilla. (The number of diseased cushions and witchbroom on these trees averaged around four hundred.) Sixty buds were set on healthy seedling stocks at St. Clair (a disease-free area). At the same time budwood was obtained from a disease-free area and 40 of these buds were set on healthy seedling stocks to serve as control.

The seedlings were budded in May, 1932, and were set out in beds in July, 1932. Of the 60 seedlings budded with material from the very heavily infected area 15 healthy shoots developed ; the remaining 45 buds failed. None showed any symptoms of witchbroom disease. Of the 40 controls, 12 shoots developed ; the remaining 28 buds failed.

While the number of buds which failed is large it is more or less in keeping with that of the controls which failed, and cannot be attributed to the agency of witchbroom disease. Dry weather which prevailed at the time of budding and possible injury to the buds during transportation are probably accountable for most of the failures.

However, the results obtained tend to show that the dormant buds were not infected.

7.—Cytological Investigation.

In order to investigate further the possibility of dormant bud infection, cytological studies were pursued during the last ten months. Reproductive and vegetative dormant buds and buds in the early stages of activity were collected from very heavily infected trees in April, 1932. The buds were removed from the trees and put into bottles containing formalin-acetic-alcohol killing and fixing agent. They were imbedded in paraffin and serial sections were made with a microtome.

In the course of examining these sections various staining reagents were tried until a satisfactory differential staining method was found in the use of picric acid and analine blue. A similar series of buds collected from healthy trees in a disease-free area (St. Clair) served as controls. The results are summarised in the following table :—

Description of buds.	*Number.*	*Observations.*	
1. *From heavily infected trees.*			
Reproductive dormant	140	No signs of the disease in tissues.	
Reproductive active	108	do.	do.
Vegetative dormant..	73	do.	do.
Vegetative active	5	do.	do.
2. *Controls from healthy trees.*			
Reproductive dormant	10		
Reproductive active	17		
Vegetative dormant..	10		
Vegetative active	10		

The results clearly show not a single instance of infected tissue in the 326 buds from heavily infected trees which had been examined.

8.—Incidence of spores in the air.

From May 20th to June 28th, 1932, attention was given to the incidence of spores in the air. Spore traps which took the form of microscope slides coated on one side with vaseline were exposed in the crowns of trees on rods, and in the forks of the lower branches. On each occasion 20 slides were exposed over night, collected in the morning and examined under the microscope. The traps were set at Manzanilla in a heavily infected area, at Cumuto in a lightly infected area, and at Arima in a disease-free area. No spores were trapped at the two last named places, while at Manzanilla spores were found as follows :—

June 8th—1 spore.
June 13th—3 spores.
June 15th—2 spores.
June 16th—1 spore.
June 21st—2 spores.

An attempt to germinate the spores failed, but there is little doubt in the mind of the writer that from their morphological characters they were the spores of *Marasmius perniciosus*.

9.—Discussion and Conclusions.

Reviewing the foregoing investigations it is quite clear that dormant buds cannot be infected by artificial inoculation with spores. This apparently holds true for natural inoculation by air-borne spores since the cytological investigations and budding trials have yielded negative results. From these investigations it is concluded that dormant buds are not susceptible to infection and hence some other explanation must be offered to account for the abundance of infected organs in the advanced dry season. Since the period of incubation of the disease varies from three to eight weeks, it is also concluded that infections take place during the course of the dry season. This is substantiated by the incidence of spores in the air before the commencement of the rainy season. The studies in connection with the conditions suitable to mushroom development also indicate that diseased organs lying hidden among weeds especially near pools of water can produce mushrooms during the dry season. When it is considered that heavy showers of rain occur from time to time during the dry season there is little reason to doubt that mushrooms develop and supply the inoculum for new infections.

B. G. MONTSERIN,
Agricultural Officer.

REPORT OF THE CHIEF INSPECTOR, PLANT PROTECTION ORDINANCE.

The Plant Protection staff comprised 36 assistant inspectors at the beginning of the year. Due to a re-arrangement of duties in May, it was made possible for me to carry out a detailed investigation of Coconut soils and the field work of the entire staff was under the direction of Mr. Foster, Supervising Officer, Witchbroom Control. As a result of this arrangement, cacao beetles and witchbroom inspectors were grouped together and distributed over the cacao producing areas affected by beetles and witchbroom. Mosaic inspectors were not included in this re-arrangement. The staff was then reduced to 31 inspectors distributed as follows :—

Mosaic Disease.—Three assistant inspectors, one in the Northern belt and two in the Couva area.

General Inspectors.—Twenty-eight inspectors under the direction of the Supervising Officer, Mr. Foster, and his assistant, Mr. de Boehmler.

The Agricultural Advisers have been responsible for carrying out Plant Protection work in their respective counties.

Control Work on Pests and Diseases.

Witchbroom.—There was a further spread of this disease during the year, 3,887 properties being known to be affected at the end of December. This was an increase of 1,433 properties over the corresponding number for December, 1931.

The usual seasonal variation in the numbers of brooms observed was exhibited during the year. There was a gradual increase of brooms at the beginning of the year the peak reaching its maximum in March. There was then a gradual decline until June and then a further increase until September. For the remainder of the year there was a gradual falling off in the number of brooms observed.

The worst affected areas are Manzanilla, Guaico-Tamana and Mundo Nuevo. New sporadic outbreaks occurred at Diego Martin, Santa Cruz and Caura.

Lectures were held as usual throughout the island. The attendance in most cases being satisfactory. As a result of the special campaign instituted in the middle of the year a great many additional lectures were given and a large number of pamphlets and posters referring to the disease were distributed.

Five proprietors were prosecuted for not complying with Plant Protection Orders.

Cacao Beetle.—On the whole beetles were not as prevalent during the year as they were in the previous year. This was due, no doubt, to the very wet weather experienced throughout the year.

In the Southern districts, however, beetles were comparatively prevalent and are still a serious menace to the crop in this area especially.

Mosaic Disease.—This disease occurs in two main areas in Trinidad.

(*a*) Northern Area.—This area is made up of plots bordering the Eastern Main Road from the 4th to the 11th mile. A few plots only are seriously affected, the incidence of the disease being generally slight.

One Assistant Inspector under the supervision of the Adviser for St. George has carried out regular inspections and supervised the removal of infected stools.

(*b*) Couva Area.—This area comprises about 1,800 acres around Couva. During the year two assistant inspectors under the supervision of the Adviser for Caroni have carried out regular inspections.

The incidence of the disease is higher in this area than in the Northern area.

Some plots have been seriously affected, but on the whole the number of diseased stools found is decreasing gradually.

Parasol Ants.—Complaints were dealt with in Port-of-Spain as usual during the year. A good many of these were on property belonging to public bodies. The destruction of these pests on Crown Lands was carried out by the Advisers for the respective counties. Due to the other duties of these officers only a limited time could be spent on parasol ant destruction in the past, but, at the ending of the year the Wardens consented to allow their staff to co-operate with the Department in controlling the pest on Crown Lands. This has resulted in greater efficiency in controlling this pest.

Customs and Post Office Inspection Work.

Mr. Farrell, Assistant to the Entomologist, has carried out the usual inspection of plant material coming into the Colony at the Customs and Postal Departments. He also issued Inspection Certificates for plant material leaving the Colony, whilst I was engaged on investigational work on Coconut Soils.

I have the honour to be,

Sir,

Your obedient Servant,

F. M. BAIN,
Chief Inspector, Plant Protection Ordinance.

24th January, 1933.

APPENDIX A.

Cane Variety Trials.

The trials mentioned on pages 13 and 14 of the Annual Report for 1931 have been continued and extended.

Full details are given in a separate Bulletin recently published.

Experiments are now being conducted at fifteen points in the Island. The salient features of the results to date are summarised below :—

Table 1.

1929 Planting.—Yield in tons per acre.

Caroni Estate.	C.O. 213.	B. 417.	Uba.	B.H. 10/12.	Ba. 11569.	T. 2020.	Mean.	Standard Error.
Plants	32.18	30.77	30.68	27.13	24.93	22.46	28.03	1.01
1st Ratoons ..			Plot destroyed by Froghoppers.					
Average ..	32.18	30.77	30.68	27.13	24.93	22.46	—	—

Waterloo Estate.	Ba. 11569	Co. 213	B. 156	Uba.	P.O.J. 213	B.H. 10/12	S.C. 12/4.	T. 2020	T. 1198	B. 417	Mean.	Standard Error.
Plants ..	30.7	30.03	28.2	27.0	24.8	24.5	23.8	22.5	22.5	18.8	25.29	5.0
1st Ratoons	29.61	24.24	22.35	12.21	11.41	10.91	8.93	7.29	6.45	5.64	13.90	1.25
Average	30.15	27.13	25.27	24.60	18.10	17.70	16.36	14.89	14.47	12.22	—	—

Brechin Castle Estate	I.C.T.A. 36	B. 417	B.H. 10/12.	T. 1198	Ba. 11569.	T. 917.	Mean.	Standard Error.
Plants	27.50	25.39	24.60	24.39	22.96	22.00	24.47	1.04
1st Ratoons ..	27.02	26.87	25.66	21.77	21.03	20.62	23.82	1.26
Average ..	27.26	26.13	25.13	23.08	21.99	21.31	—	—

Esperanza Estate	C.O. 213.	T. 2020	Ba. 11569	T. 1198	B. 156	Uba.	B.H. 10/12.	Mean.	Standard Error.
Plants ..	29.94	20.07	26.12	26.06	24.59	23.37	23.9	26.14	7.1
1st Ratoons	34.73	28.60	25.70	24.62	23.84	21.49	21.36	24.66	0.97
Average	32.33	24.33	25.91	25.34	24.21	22.43	22.63	—	—

The results obtained from the six experiments planted in 1930 must not be taken as final. One reason in particular, is that the " dry season " from January to May at the end of the growing period, was abnormally wet. The effect of this weather was to increase tonnage of canes at the expense of the sucrose content. Further effects were to prolong the growing period, favour side shoots, especially in P.O.J. 2878, and generally to mitigate against a good yield of mature canes.

Nevertheless, the average yield, both in cane and sugar from certain varieties provides justification for their further trial as against the standard cane, B.H.10(12). The promising canes are dealt with in more detail below.

P.O.J. 2878.

This cane, in spite of its production of side shoots late in the season, has appeared in the forefront both in yield of cane and sugar on every estate on which it has been tried. Its sucrose per cent. cane figures gradually improved as the season advanced, reaching 14.1 per cent. on a heavy soil and 10.43 per cent. on a light soil at the third harvesting in May. It is possible that in a normal dry season these figures would be better earlier in the season. The purity is fairly high. The average tonnage for all the estates on which it was grown was 38.4 tons plant canes.

B. 726.

This newly released Barbados seedling has shown promise. At Caroni, where conditions during the period were bad, this cane headed the table. It appears to mature fairly early as its sucrose per cent. cane during March to May period—three harvestings—varied only between 12.48 and 13.16 per cent. This cane was also tried out at Woodford Lodge where it averaged over 42 tons cane per acre. Sugar figures are unfortunately not available from this estate. The average tonnage from the two estates was 30.15 tons plant canes.

B.H. 10(12).

This, the standard cane in Trinidad, has maintained its repute although it had a fight to keep its supremacy, in particular at Waterloo, where five canes surpassed it in average tonnage of canes and three in sugar production. Nevertheless, it remains the best known cane for general purposes in good soil. Its average yield in cane per acre for all experiments was 32.15 tons.

F.C. 916.

This vigorous cane, bred at Farjardo Central, Puerto Rico, was introduced through Mr. Taylor, of Orange Grove, and was included only in the variety trial on that estate. It heads the list of all varieties under trial for tonnage of cane, having given 49 tons plant canes per acre ; its theoretical sugar yield being nearly five tons per acre at the 3rd harvesting in May. It would seem to merit further trial under other conditions.

Table 2.

1930 Plantings.—Summary of Cane Harvestings on Each Estate.

	B. 726.		T. 2395.		B.H. 10 (12).		T. 1198.		P.O.J. 234.		B. 39.		Mean.		Standard Error.	
	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.
CARONI:																
1st Harvesting ..	19.65	2.51	18.70	2.21	17.95	2.18	16.66	1.70	14.41	1.55	11.56	1.27	—	1.90	—	0.15
2nd do. ..	15.84	—	14.69	—	12.31	—	12.51	—	10.40	—	9.32	—	—	—	—	—
3rd do... ..	21.28	2.80	19.38	2.46	15.50	2.04	16.12	1.77	11.49	1.23	12.38	1.47	—	1.96	—	0.18
Average ..	18.92	2.65	17.59	2.33	15.25	2.11	15.09	1.73	12.10	1.39	11.08	1.37	—	—	—	—

NOTE.—Owing to an oversight, this Estate did not examine the second harvesting for sucrose content.

	C.O. 213.		T. 1198.		Uba.		P.O.J. 2878.		B. 156.		B.H. 10 (12)		T. 2020.		P.O.J. 234.		Mean.		S.E.	
	Cane.	Sugar	Cane.	Sugar	Cane	Sugar	Cane	Sugar	Cane	Sugar	Cane	Sugar	Cane	Sugar	Cane	Sugar	Cane	Sugar	Cane	Sugar
WATERLOO:																				
1st Harvesting	40.73	4.16	36.27	3.60	31.42	3.55	30.49	3.55	29.18	3.24	20.79	2.50	18.94	2.08	16.71	2.03	—	3.09	—	0.38
2nd do.	42.12	4.35	48.36	3.68	39.96	4.79	29.41	5.26	34.88	4.19	28.03	4.87	34.03	3.54	22.10	2.83	—	4.19	—	0.39
3rd do.	41.89	4.82	40.27	3.22	35.81	4.55	21.71	5.06	28.34	3.41	20.94	3.97	27.26	2.68	21.41	2.87	—	3.82	—	0.33
Average	41.58	4.44	41.63	3.50	35.73	4.30	27.20	4.62	30.80	3.61	23.25	3.78	26.74	2.77	20.07	2.58	—	—	—	—

	B. 417.		P.O.J. 2878.		F.C. 916.		B.H. 10 (12)		T. 2020		P.O.J. 36		Mean.		Standard Error.	
	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.	Cane.	Sugar.
ORANGE GROVE:																
1st Harvesting ..	49.23	4.81	47.32	4.22	47.26	4.21	42.77	3.96	37.47	3.11	35.90	2.73	—	3.84	—	0.22
2nd do.	46.17	4.86	53.11	5.30	46.38	4.67	42.30	4.37	40.80	3.53	38.28	3.69	—	4.40	—	0.17
3rd do.	51.48	5.56	52.70	5.50	51.34	4.97	41.62	4.37	45.83	3.54	40.66	4.52	—	4.74	—	0.31
Average ..	48.96	5.08	51.04	5.01	48.32	4.62	42.23	4.23	41.36	3.39	38.28	3.65	—	—	—	—

Table 2.—*Continued.*

Brechin Castle.	T. 2020.	B. 417.	B.H. 10/12.	I.C.T.A. 36.	P.O.J. 2878.	P.O.J. 979.
1st March ..	33.00	31.98	30.72	29.40	27.84	26.52
2nd April ..	29.40	26.72	29.74	26.35	26.17	23.97
3rd May ..	29.34	25.07	32.82	24.77	30.07	23.91
Average ..	30.76	28.10	31.46	27.00	28.18	24.95

Note.—Figures for Sugar tons per acre not available.

Woodford Lodge.	Uba.	B.H. 10/12.	P.O.J. 2878.	B. 726.	T. 2020.	Ba. 11569.
1st February ..	56.18	49.68	43.12	39.81	31.38	30.87
2nd April ..	53.07	52.14	51.83	41.85	28.33	36.21
3rd May ..	53.57	59.15	50.65	46.19	37.32	33.85
Average ..	54.13	53.52	48.42	42.51	32.26	33.56

Note.—Figures for Sugar tons per acre not available.

B. 417.

This well known cane has not lost its reputation on any of the estates where it was included. It does best on light lands and is well up the list in both tonnage of cane and sugar. Its sucrose per cent. cane remained fairly constant between March and May. Its behaviour warrants its inclusion in further trials on the light lands.

Of the noble canes, B.H. 10 (12), P.O.J. 2878, B. 417 and F.C. 916 appear to warrant further experiment.

C.O. 213.

This Coimbatore has done extraordinarily well both as plants and first ratoons under conditions which exercised a severe check on other varieties except Uba. It averaged nearly 40 tons of cane per acre as plants on all the estates on which it has been included and in the present seasonal conditions its sugar return has been comparable with better canes. It has withstood the attack of Froghopper in striking fashion. It is, however, a thin slow-maturing cane of rather low purity and is not easy to handle on that account, with the filtering and settling equipment in most Trinidad factories. In regard to time of harvesting no general conclusion can be drawn, owing to the abnormal weather. The heavy rain in March seems to have affected, adversely, the yield of the second harvesting, in some cases. In others there was dying out of canes left as late as May. Otherwise, as was to be expected, there was a general increase in tonnage of canes the longer the harvesting was delayed. In respect to sucrose content, however, it is interesting to note from Table **3** that the percentage increased regularly from March to May in the case of P.O.J. 2878 and B.H. 10(12) not only on the same estate, but also as the texture of the soil increased from light to heavy. With B. 417 and B. 726, however, the sucrose per cent. cane was fairly constant during the whole harvesting period. See Table 11.

Table 3.

Comparison of Sucrose per cent. cane under different Soil Conditions.

Estate.	Soil.	Harvesting.		
		1st.	2nd.	3rd.
			P.O.J. 2878.	
Orange Grove	Light	8.92	9.97	10.43
Waterloo	Heavy	11.3	13.1	14.1
Brechin Castle	Light	14.27	16.21	16.84
			B.H. 10(12).	
Orange Grove	Light	9.26	10.34	10.51
Caroni	Medium	12.16	12.27	13.17
Waterloo	Heavy	13.20	14.30	14.55
Brechin Castle	Light	16.79	19.05	19.62
			B. 417.	
Orange Grove	Light	10.17	10.49	10.83
Brechin Castle	Light	16.86	18.19	18.98
			B. 726.	
Caroni	Medium	12.76	12.48	13.16
			F.C. 916.	
Orange Grove	Light	8.55	10.12	9.65

Two additional experiments were laid down during the year.

APPENDIX B.

Revenue and Expenditure.

	Expenditure. £ s. d.	*Revenue.* £ s. d.
HEAD OFFICE :		
Personal Emoluments	7,293 4 11	93 15 0
Travelling and Other Charges	1,953 1 7	20 0 0
Laboratory Expenses and Field Experiments..	517 7 4½	—
Banana Shipment	158 7 11	97 1 3
BOTANICAL DEPARTMENT, TRINIDAD :		
Personal Emoluments	195 1 10	—
Maintenance and Improvements, Royal Botanic Gardens and St. Clair Experiment Stations	1,113 11 4	—
Care of Trees on Government Lands	76 4 2½	—
Maintenance, Red House Grounds	66 13 6½	—
Other Charges	180 3 4	—
BOTANICAL DEPARTMENT, TOBAGO :		
Personal Emoluments, Travelling	337 10 0	—
Maintenance, Botanic Station and Government House Grounds..	338 10 2	70 17 1
		—
ST AUGUSTINE NURSERY :		
Personal Emoluments	426 3 8	—
Maintenance, &c.	1,939 11 5	1,203 12 4
Other Charges	262 5 2½	—
RIVER ESTATE :		
Personal Emoluments	600 0 0	—
General Maintenance, &c.	3,656 14 5½	3,246 6 7
Improvements	517 1 7	—
ST. AUGUSTINE EXPERIMENT STATION :		
Personal Emoluments	372 0 0	—
Maintenance, Cultivation of Crops, &c.	1,991 19 4	877 1 7
GOVERNMENT FARM, TRINIDAD :		
Personal Emoluments	640 0 0	—
Maintenance	4,639 13 7	5,911 3 2
Purchase of Stock (Trinidad and Tobago)	612 9 3	—
GOVERNMENT FARM, TOBAGO :		
Personal Emoluments	250 0 0	—
Maintenance	616 9 8	315 16 10
		—
GOVERNMENT VETERINARY SURGEON :		
Assistant Examiners and Contingencies	215 15 1½	1,360 10 0
QUEEN'S PARK AND PASTURES :		
Personal Emoluments	125 0 0	—
Maintenance	914 11 10½	279 8 5
DISTRICT SERVICE :		
Personal Emoluments, Travelling, &c.	3,957 4 8	—
PLANT PROTECTION ORDINANCE :		
Personal Emoluments	400 0 0	—
Travelling, &c.	185 14 10	—
Destruction of Pests on Crown Lands	98 5 6½	—
Froghopper Investigation	4,892 5 10½	2,766 5 10½
Control of Plant Diseases and Pests	9,954 13 4	—
AGRICULTURAL CREDIT SOCIETIES :		
Personal Emoluments, Travelling, &c.	42 18 9	—
TOBAGO ABATTOIR :		
Maintenance, Travelling, &c.	120 5 8	49 11 1
MARPER FARM :		
Maintenance	899 19 4	423 3 6½
Total	£50,560 19 4½	£17,414 12 9

APPENDIX C.

Principal Agricultural Exports, Trinidad and Tobago.

	1931.		1932.	
	Quantity.	Value.	Quantity.	Value.
CACAO :		£		£
Raw Cacao	57,186,512 lb.	826,333	41,822,127 lb.	579,170
SUGAR CANE AND PRODUCTS :				
Vacuum pan, Grey Crystal ..	61,390 tons	595,007	68,245 tons	611,662
Do. White Crystal ..	..	..	..	..
Do. Yellow Crystal ..	23,721 tons	297,830	16,519 tons	219,114
Molasses Crystal ..	933 tons	10,146	1,193 tons	15,098
Muscovado Sugar	1 ton	7	—	—
Molasses	1,599,414 gals.	15,924	2,701,921 gals.	14,697
Rum	86,260 gals.	15,719	139,540	27,521
Bitters	15,700 gals.	27,288	10,564 gals.	18,962
COCONUT AND PRODUCTS :				
Coconuts	4,487,875 No.	12,549	3,847,245 No.	12,822
Copra	19,484,808 lb.	101,148	15,418,906 lb.	91,444
Coconut Oil	20,702 gals.	1,818	26,461 gals.	2,520
COFFEE :				
Raw Coffee	853,552 lb.	16,080	908,492 lb.	20,822
RUBBER :				
Raw Rubber	..	..	..	..
LIMES :				
Limes	83 brls.	128	189 brls.	145
Lime Juice	26,943 gals.	2,465	49,629 gals.	4,250
Lime Oil	2,413 gals.	32,071	929½ gals.	12,840
Citrate of Lime	21,589 lb.	257	54,217 lb.	424
GRAIN, PULSE, STARCHES, &c. :				
Corn (Maize)	156,935 lb.	564	81,376 lb.	339
Peas and Beans	577,031 lb.	2,783	300,065 lb.	1,993
FRUIT :				
Grapefruit	350,530 No.	1,876	10,973 Boxes	8,698
Oranges	2,519,792 No.	2,711	1,579 boxes	1,216
Other Kinds	..	96	..	..
MISCELLANEOUS :				
Plants and Seeds	..	202	..	239
Spices (Nutmegs)	13,989 lb.	238	22,328 lb.	270
Honey	24,173 lb.	345	21,166 lb.	209
Live Stock	65 No.	1,382	52 No.	2,630
Hides and Skins	4,969 No.	4,821	761 No.	289
Leather (unmanufactured) ..	12,286 lb.	748	9,190 lb.	494
		£1,970,582		£1,647,935

APPENDIX D.

ANNUAL RAINFALL 1862 TO 1932, PORT-OF-SPAIN, TRINIDAD.

1862 to 1899 at the Royal Botanic Gardens. January, 1900 onwards at the closely adjacent St. Clair Experiment Station.

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Rainfall.
	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Inches.
1862 ..	..	.66	.77	.25	1.41	8.47	10.36	9.57	11.97	6.60	10.06	3.03	63.15
1863 ..	1.54	2.71	1.45	.85	1.26	9.12	10.12	10.53	12.11	6.24	4.30	6.57	66.80
1864 ..	2.51	.53	.36	.04	8.15	4.96	7.17	12.06	8.04	6.53	5.94	6.61	62.90
1865 ..	2.62	3.20	1.07	7.98	3.22	5.64	10.35	14.83	7.32	14.62	4.81	9.62	85.28
1866 ..	2.24	3.91	1.44	1.09	1.45	6.59	7.83	12.34	5.87	10.11	8.17	6.82	67.86
1867 ..	1.31	6.36	.83	1.32	2.33	5.30	12.20	15.21	10.45	7.87	.67	2.71	66.56
1868 ..	2.06	.82	3.20	.64	4.17	7.78	11.35	6.73	5.46	4.66	8.31	1.03	56.21
1869 ..	.08	.93	.74	.41	.69	5.52	10.17	8.74	8.86	5.15	6.30	5.87	53.46
1870 ..	2.61	.56	1.46	1.51	4.65	8.81	11.91	9.00	10.63	3.98	5.94	8.29	69.35
1871 ..	6.62	1.40	2.89	.92	3.97	8.84	11.73	12.97	7.87	4.37	10.73	3.27	75.58
1872 ..	1.45	.07	.74	.39	3.14	7.09	5.45	10.82	3.07	4.80	9.89	3.04	49.95
1873 ..	1.78	1.08	1.98	.53	..	4.31	5.04	8.37	5.80	10.34	3.48	1.31	44.02
1874 ..	3.47	1.96	3.67	5.16	2.51	12.28	12.28	11.20	9.38	6.42	3.66	4.29	76.28
1875 ..	3.39	.91	.56	.42	2.61	4.15	12.62	7.22	11.95	10.85	3.74	2.48	60.90
1876 ..	3.26	1.03	1.78	1.67	6.65	11.17	12.23	15.18	12.03	7.04	5.95	3.96	81.95
1877 ..	2.14	..	7.46	3.38	3.19	8.43	8.35	12.94	6.39	6.68	7.66	5.48	72.10
1878 ..	3.44	.70	..	3.22	4.99	5.78	5.42	8.88	11.15	5.89	8.72	3.05	61.24
1879 ..	1.52	2.76	4.56	3.03	3.08	14.92	6.86	10.35	6.15	3.54	4.28	4.38	65.43
1880 ..	11.72	6.53	.67	2.32	3.90	7.83	6.30	17.39	7.47	5.74	10.51	1.96	82.34
1881 ..	.57	.65	.23	1.60	4.66	11.05	7.82	10.90	10.59	3.36	12.06	2.23	65.72
1882 ..	1.33	2.38	.73	1.57	3.74	6.33	5.93	8.40	4.93	5.86	10.29	1.50	52.99
1883 ..	1.56	.71	.26	3.37	5.89	10.91	13.66	10.26	5.53	3.99	6.06	8.30	70.50
1884 ..	3.43	2.50	4.40	1.51	2.91	6.84	5.71	8.70	5.03	5.05	5.14	5.66	56.88
1885 ..	1.30	.89	1.49	.43	5.27	3.44	5.87	4.56	6.08	4.08	5.37	4.44	43.22
1886 ..	3.32	1.97	3.27	3.83	4.49	9.70	17.48	8.15	6.73	12.59	8.54	6.75	86.82
1887 ..	2.69	1.46	1.67	1.08	3.98	7.40	5.51	9.93	5.07	5.84	7.60	11.86	64.09
1888 ..	8.37	1.79	2.41	2.28	3.46	11.92	6.89	7.02	5.53	5.06	7.76	2.95	65.44
1889 ..	.94	.85	4.16	1.05	6.34	11.66	12.14	11.73	3.76	6.30	7.38	7.48	73.79
1890 ..	7.76	.51	2.09	7.62	5.14	9.68	12.89	11.65	3.37	10.98	5.93	5.28	82.90
1891 ..	3.17	.92	.03	1.44	2.54	5.54	11.88	4.26	7.44	5.77	6.66	4.09	53.74
1892 ..	1.93	2.19	1.85	7.59	11.55	16.26	15.55	9.21	3.57	11.49	5.40	4.69	91.28
1893 ..	3.43	1.85	.19	3.61	11.35	10.19	13.28	16.32	11.73	5.47	7.84	7.23	92.49
1894 ..	3.22	2.36	3.12	1.22	2.69	3.26	4.53	12.06	5.48	3.93	7.28	3.16	52.31
1895 ..	2.52	1.33	2.27	2.52	2.11	5.00	2.57	4.86	5.69	10.89	15.15	7.32	62.23
1896 ..	7.08	.88	1.59	2.33	1.62	10.29	6.35	7.66	6.46	6.05	9.81	6.33	66.45
1897 ..	1.67	.75	3.96	.26	5.58	11.19	13.88	7.90	9.83	8.87	9.39	4.40	77.68
1898 ..	3.05	2.18	2.10	1.17	1.49	6.46	5.87	10.55	7.13	6.15	9.13	3.57	58.85
1899 ..	1.95	1.82	1.00	.75	.52	7.63	4.44	8.45	2.18	6.34	8.07	3.61	46.76
1900 ..	3.56	.76	2.72	4.10	4.14	12.99	7.95	11.07	5.52	6.53	5.41	2.61	67.36
1901 ..	1.95	1.51	1.85	.35	6.45	9.21	8.38	7.53	4.26	4.97	7.93	4.83	59.22
1902 ..	2.56	.51	1.18	1.78	2.14	10.05	5.20	11.67	7.22	7.40	2.74	2.89	55.34
1903 ..	1.51	.68	1.54	2.17	.95	5.42	9.40	9.45	11.41	2.12	2.59	4.20	51.44
1904 ..	3.00	2.56	4.24	2.50	2.76	6.23	8.03	4.72	8.81	5.65	3.61	4.32	56.43
1905 ..	2.41	.59	3.74	1.79	4.34	6.01	9.49	11.09	10.43	6.94	10.69	4.16	71.68
1906 ..	.43	.50	.73	.46	7.96	10.95	11.42	8.55	6.54	6.80	5.00	5.64	64.98
1907 ..	5.22	.44	1.71	.09	4.58	11.01	11.02	5.77	7.76	7.65	10.69	4.10	70.04
1908 ..	.75	.45	1.79	.95	5.82	5.22	5.87	7.72	5.45	5.45	2.65	8.68	50.80
1909 ..	5.69	2.43	1.15	1.78	3.87	8.31	10.72	6.29	6.95	7.15	3.93	6.31	64.58
1910 ..	2.79	4.38	1.75	2.01	2.76	6.34	6.40	13.89	8.27	9.21	8.49	1.90	68.19
1911 ..	1.61	1.51	1.86	.74	1.27	7.15	5.20	13.68	4.03	10.22	3.57	3.53	54.37
1912 ..	.62	Nil.	.74	.03	2.18	7.54	12.16	5.56	5.87	2.73	6.28	5.64	49.35
1913 ..	2.80	.50	1.42	.42	1.79	2.80	2.86	6.48	6.52	3.51	8.61	1.82	39.53
1914 ..	.50	.61	1.28	1.01	2.05	7.34	5.05	9.15	7.80	6.14	7.61	5.58	54.12
1915 ..	2.10	.66	..	2.63	2.76	7.05	12.76	5.27	4.21	9.28	7.84	1.75	56.31
1916 ..	5.29	1.35	1.57	1.91	.94	10.30	8.04	11.57	10.78	6.68	9.32	1.98	69.73
1917 ..	1.17	3.06	1.38	.50	4.24	6.30	10.13	9.96	7.24	5.43	6.61	8.22	64.24
1918 ..	3.15	1.18	1.48	1.27	2.94	5.87	14.42	8.56	8.93	5.51	7.56	3.85	64.72
1919 ..	.62	..	1.78	1.67	3.50	6.78	5.17	6.82	7.96	7.79	8.42	6.67	57.18
1920 ..	1.39	1.66	.94	.28	.56	4.13	4.93	6.70	10.98	5.74	6.03	1.60	44.94
1921 ..	2.43	1.60	5.03	4.09	1.43	9.91	10.06	10.30	10.17	6.53	7.71	6.25	75.51
1922 ..	4.01	1.13	1.41	2.39	2.18	6.10	5.06	8.35	6.49	2.92	11.17	7.10	58.31
1923 ..	1.91	1.66	.96	2.97	1.46	3.48	10.76	9.37	6.23	4.41	7.38	7.32	57.91
1924 ..	1.54	.90	.14	1.11	.73	4.95	7.53	7.27	4.59	7.81	8.56	2.15	47.28
1925 ..	1.77	1.06	2.67	.10	1.21	4.20	7.58	8.87	6.37	5.85	5.36	4.36	49.40
1926 ..	.69	.39	.54	.23	2.12	5.26	5.25	10.85	11.20	14.78	9.71	7.56	68.58
1927 ..	4.71	4.44	3.62	5.04	7.15	6.95	9.40	11.67	9.11	6.13	5.64	7.21	81.07
1928 ..	4.22	.69	2.31	2.02	.67	5.75	8.07	8.66	7.36	9.13	8.42	5.94	63.24
1929 ..	.84	.84	1.78	.81	7.33	6.43	5.10	8.90	5.21	3.40	9.30	1.51	51.45
1930 ..	2.70	.08	.31	2.38	1.85	6.35	7.12	4.94	5.82	6.27	2.59	4.87	45.28
1931 ..	1.68	1.11	.07	.29	1.12	6.94	10.96	8.89	4.85	6.59	7.94	5.77	56.21
1932 ..	5.61	1·72	4.33	3.99	9.25	10.53	5.80	16.04	3.85	4.60	10.23	8.01	83.96
Grand Total ..	194.28	105.07	130.47	134.22	251.20	545.69	617.28	682.51	514.26	470.82	507.57	342.95	4,496.32
Av. for 71 years	2.74	1.48	1.84	1.89	3.54	7.60	8.69	9.61	7.24	6.63	7.15	4.83	63.33